The wood processing industry and wood residues for heat production
Summary

• Wood processing has a low overall carbon footprint
• Wood processing process heat carbon footprint is very low
• There is potential for significant improvement in renewable process heat percentage via -
  • Large increase in NZ wood processing with little or no carbon footprint increase
  • More residues available to replace fossil fuel in process heat applications in other industries
Agenda

• Wood flows
• Log uses - value chain
• Residues for heat production
  • Volumes
  • Cost structure
• Process heat footprint
• Potential for improvement in renewable process heat percentage
NZ Wood Flows (million m$^3$ roundwood equivalent) 2014

- Annual harvest: 30.2 million m$^3$
- Processed in NZ: 13.6 million m$^3$
- Remanufactures:
  - Plywood: 0.40 million m$^3$
  - Lumber: 1.2 million m$^3$
  - Pulp/paper: 7.2 million m$^3$
  - Fibre panels: 3.7 million m$^3$
- Chips: 3.8 million m$^3$
- Log + chip exports: 16.6 logs; ~0.4 chips
- Residues for heat not shown
- 13M T CO2

Processed in NZ:
- 45% of annual harvest
- 55% of annual harvest
Utilisation of typical CNI radiata tree as harvested today

Lower value Toplog 2 and Toplog 1 have been for pulp mill use but both increasingly used as industrial sawlogs.

SLABWOOD ie material used to produce pulp, particle board, MDF...

SAWN TIMBER

Ave radiata basic density at Age 28

<table>
<thead>
<tr>
<th></th>
<th>TOPLOG 2</th>
<th>TOPLOG 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at Age 28</td>
<td>390 kg/m³</td>
<td>405 kg/m³</td>
</tr>
<tr>
<td>Typical 2016 delivered cost per tonne</td>
<td>NZ$50-100</td>
<td>NZ$80-110</td>
</tr>
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<thead>
<tr>
<th></th>
<th>SAWLOG 2</th>
<th>SAWLOG 1</th>
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</thead>
<tbody>
<tr>
<td>Density at Age 28</td>
<td>420 kg/m³</td>
<td>435 kg/m³</td>
</tr>
<tr>
<td>Typical 2016 delivered cost per tonne</td>
<td>NZ$120</td>
<td>NZ$135</td>
</tr>
</tbody>
</table>
Secondary residues for heat 2020-2030 Woodco strategic plan - sources, volumes

Lumber, ply processing plants

<table>
<thead>
<tr>
<th>Material</th>
<th>Volume (M m$^3$)</th>
<th>Net PJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>sawdust, bark, shavings etc</td>
<td>Total produced</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Available for external use</td>
<td>~ 0.6</td>
</tr>
</tbody>
</table>

Forest floor BUT AT WHAT COST??

<table>
<thead>
<tr>
<th>Source</th>
<th>Volume (M m$^3$)</th>
<th>Net PJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skid</td>
<td>~ 1.4</td>
<td>~ 10</td>
</tr>
<tr>
<td>Floor</td>
<td>~ 1.7</td>
<td>~ 12</td>
</tr>
</tbody>
</table>

Notes:
Woodco plan 50% increase in processing at improved energy efficiency
Residue volumes source – Scion very approximate
Volumes are assessed practical retrieval volumes – 100% skid, 50-70% floor
Secondary residues cost curve

~ $/net GJ

Cumulative tonnes

forest residues

Other processing plant

own processing plant
Process Heat use by Industry and Fuel Type in 2014

% renewable ~ 24%

1990 emissions levels

Biomass + Geothermal

Wood (11.8 kt CO₂/PJ)
Pulp & Paper (12.4 kt CO₂/PJ)

Fossil Fuels

Meat (71.9 kt CO₂/PJ)
Dairy (67.9 kt CO₂/PJ)
Other (66.0 kt CO₂/PJ)
Metal (58.9 kt CO₂/PJ)
Petrochemical (56.5 kt CO₂/PJ)
Food (54.4 kt CO₂/PJ)
Future Scenarios of Wood Energy for Emission Reduction

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**Future Scenarios (WPMA)**

**Scenario 1:**
- Wood harvest increases by ~ 50%
- Wood processing and pulp & paper production increases by 50% @ 80% energy intensity (i.e. 20% more energy efficiency) using black liquor and wood derived fuels (zero emission increase).

**Scenario 2:**
- Scenario 1 +
- 4 PJ of excess residues from wood processors available to dairy processing, substitution for coal

**Scenario 3:**
- Scenario 2 +
- 10 PJ of wood from residues from forest logging skid sites available to dairy processing, substitution for coal
Scenario 1

The diagram illustrates the relationship between process heat (PJ) and emissions (Mt CO₂-e) for various industries, including Wood Processing, Pulp and Paper, Aluminium, Methanol, Food Processing, Horticulture, Other Manufacturing, Dairy, Meat Processing, Petrochemical, Cement, Steel, and Wood, pulp & paper sectors. The graph shows the emissions and process heat data for the year 2014 (S.1) and highlights an increase of +25 PJ for the Wood, pulp & paper sectors.
Scenario 2

-370 kt CO2-e (Dairy using +4 PJ wood for coal)

+25 PJ (Wood, pulp & paper sectors)
Scenario 3

-1,280 kt CO₂-e
(Dairy using +14 PJ wood for coal)

+25 PJ
(Wood, pulp & paper sectors)

0 50 100 150 200 250
Process Heat (PJ)

0 2 4 6 8 10
Emissions (Mt CO₂-e)

Wood Processing
Pulp and Paper
Aluminium
Methanol
Food Processing
Horticulture
Other Manufacturing
Dairy
Petrochemical
Meat Processing
Steel
Cement
Other Manufacturing
Horticulture
Food Processing
Methanol
Aluminium
Dairy
Pulp and Paper
S.3
2014
Conclusion

• Increasing wood processing in NZ will have a significant impact on process heat renewable percentage

• Improvement from ~24% to ~36% renewable is possible via
  • 100% renewable heat used in additional wood processing
  • Additional wood energy available for other industries.

• PLUS other advantages – exports, regional focus, low carbon content products