Wood Energy in Ireland – Potential Contribution to GHG Reduction

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NATIONAL COUNCIL FOR FOREST RESEARCH & DEVELOPMENT
Overview

- Forestry in Ireland
- Forms of Wood Biomass
- Quantification of supply potential
- Energy Value of supply potential
- Carbon dioxide emissions avoidance potential
- Optimisation of Wood Biomass in Ireland
- Conclusion
## Forestry in Ireland

### Forest Cover

<table>
<thead>
<tr>
<th>Year</th>
<th>% Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>16</td>
</tr>
<tr>
<td>1900</td>
<td>1</td>
</tr>
<tr>
<td>2000</td>
<td>9</td>
</tr>
<tr>
<td>2030 (target)</td>
<td>17*</td>
</tr>
</tbody>
</table>

* Requires 20,000 ha of afforestation p.a. as outlined in the Government’s Strategic Plan *Growing for the Future*
Forest Estate

Afforestation 1920 – 2001

hectares

Spatial Distribution of Irish Forests
Sources of Wood Biomass

- **Forests**
  - Roundwood

- **Processing Sector**
  - Wood Products

- **End Users**
  - Post-consumer Recovered Wood
    - Pallets
    - Packaging
    - C&D Waste

- **Direct biomass**
  - Pulpwood
  - Wholletree chips
  - Forest residues

- **Indirect biomass**
  - Sawdust
  - Woodchip
  - Bark
  - Slabwood
Current Product Flow from Irish Forest

**Roundwood Usage**
- Coillte 2,661 (83%)
- NIFS 381 (12%)
- Private 175 (5%)
- Total 3,217

**All Ireland Year 2001**

**Sawn Timber Products**
- Construction
- Fencing
- Pallet
- Other
- Total 1,029

**Sawn Yield (o.b.) 47%**

**Sawlog**
- 2,171 (67%)

**Pulp Logs & Stakes**
- 1,046 (33%)

**Boardmills Sector**
- Pulpwood
- Stakes
- Export Logs

**Co-products**
- Chips
- Sawdust
- Bark
- Total 1,142
- Export Residues

Source: Coillte (2002)
Current Co-products and Pulpwood Markets

- Five Panelboard mills
  - Smartply Europe (OSB plant)
  - Weyerhaeuser (MDF plant)
  - Finsa (chipboard)
  - Masonite (fibreboard door skins)
  - Spanboard (chipboard)
- All use wood biomass for

Source: Coillte (2003)
Direct Biomass

Direct from Irish Forests

- Pulpwood from shortwood system
- Whole-tree chips
- Forest Residues
Future Roundwood Supply

Forecast of Roundwood Volume coming from Irish Forest 2001 - 2015

- Coillte
- N.I.F.S.
- Private
Direct Biomass - Pulpwood

- **Private Sector Growth**
- **Total potential supply by 2010** will be 1.9 million green tonnes p.a.
- **Energy market supply potential** (i.e. excess over projected panelboard and stakewood markets):
  - 186,000 green tonnes (2003)
  - 760,000 green tonnes (2010)
Direct Biomass - Whole tree chips

- Alternative to shortwood system for early thinnings
- Allows earlier thinning – access for pruning
Direct Biomass - Forest Residue

- Current untapped resource
- Harvesting potential depends on site type and conditions (nutrient retention and ground bearing capacity)
Forest Residue Bundler

Purpose made slash bundler (Timberjack)
Forest Residue Bundler

Bundles are taken to roadside by standard forwarder
Bundles become just another product assortment – same as pulp, pallet and sawlog
Forest Residue Bundler

Bundles can be stored at roadside or power plant to allow for some natural drying.
Forest Residue Bundler

Bundles can be chipped either directly on arrival over after a period of storage.
Direct Biomass - Forest Residue Supply Potential

- 8,000 ha of clearfell p.a.
- Potentially 40 m$^3$ forest residue per hectare
- Estimate based on UK figures suggest the following supply potential in Ireland:
  - **200,000 green tonnes (2003)**
  - **280,000 green tonnes (2010)**
Indirect Biomass

Biomass from primary and secondary processing

- Sawdust
- Woodchip
- Bark
- Slabwood

Image source: Centre for Biomass Technology (1999)
Photograph by Flemming Rune, DFLRI
Sawmill Residues

- Woodchips: 70%
- Sawdust: 11%
- Bark: 19%

□ Woodchips □ Sawdust □ Bark
Indirect Biomass - Supply Potential

- Total potential supply by 2010 will be 1.35 million green tonnes p.a.
- Energy market supply potential (i.e. excess over projected panelboard and stakewood markets):
  - 150,000 green tonnes (2003)
  - 250,000 green tonnes (2010)
- Supply to energy or panelboard mills is price (ex. Mill) dependent
- CURRENTLY SAWDUST FROM ONE IRISH SAWMILL IS BEING EXPORTED TO CO-FIRE A UK COAL BURNING STATION
Post-consumer Recovered Wood

- Wood and wood based products recovered from the waste stream
  - Pallet
  - Packaging
  - C&D Waste
Post-consumer Recovered Wood

Driving Factors for Increased Availability:
- *Rising landfill costs*
- *Local authority desire to maximise recycling*

Issues to be resolved:
- *Certification of segregation*
- *Treated wood waste*

Supply Potential in 2003 (conservative):
- *C&D waste 135,000 tonnes*
- *Packaging: 86,000 tonnes*

Assumption that 50% is untreated

2010??????
### Summary of Irish Biomass Supply Potential

<table>
<thead>
<tr>
<th>Biomass Source</th>
<th>Supply Potential (‘000s green tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Direct</td>
<td>386</td>
</tr>
<tr>
<td>Indirect</td>
<td>150</td>
</tr>
<tr>
<td>Post-consumer</td>
<td>221</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>757</strong></td>
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</table>
### Energy Potential of Irish Biomass Supply

<table>
<thead>
<tr>
<th>Biomass Source</th>
<th>Energy Value (PJ)</th>
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<tbody>
<tr>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Direct</td>
<td>2.43</td>
</tr>
<tr>
<td>Indirect</td>
<td>1.28</td>
</tr>
<tr>
<td>Post-consumer</td>
<td>3.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.04</strong></td>
</tr>
</tbody>
</table>

In addition, approximately 6 PJ of energy is currently derived from wood biomass in Ireland.
Kyoto and EU Burden Sharing

Source: ECCM (2003)
Current Predictions

Source: ECCM (2003)
### Carbon Dioxide Emissions from Fossil Fuels

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Emissions kg CO$_2$/kWh</th>
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<tbody>
<tr>
<td>Peat</td>
<td>1.100</td>
</tr>
<tr>
<td>Coal</td>
<td>0.912</td>
</tr>
<tr>
<td>Oil</td>
<td>0.782</td>
</tr>
<tr>
<td>Average Fuel Mix</td>
<td>0.504</td>
</tr>
<tr>
<td>Gas – Simple Cycle</td>
<td>0.489</td>
</tr>
<tr>
<td>Gas – CCGT</td>
<td>0.346</td>
</tr>
<tr>
<td>Gas - CHP</td>
<td>0.238</td>
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</table>
# Potential Reduction in CO₂ Emissions by Switching to Wood Biomass

<table>
<thead>
<tr>
<th>Fuel Type Displaced</th>
<th>Reduction in CO₂ Emissions</th>
<th>Reduction in CO₂ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tonnes per annum</td>
<td>2003</td>
</tr>
<tr>
<td>Peat</td>
<td>433,000</td>
<td>1,144,000</td>
</tr>
<tr>
<td>Coal</td>
<td>359,510</td>
<td>949,108</td>
</tr>
<tr>
<td>Oil</td>
<td>308,264</td>
<td>813,818</td>
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<tr>
<td>Average Fuel Mix</td>
<td>198,677</td>
<td>524,507</td>
</tr>
<tr>
<td>Gas – Simple Cycle</td>
<td>192,764</td>
<td>508,896</td>
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<tr>
<td>Gas – CCGT</td>
<td>136,393</td>
<td>360,078</td>
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<tr>
<td>Gas - CHP</td>
<td>93,820</td>
<td>247,684</td>
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## CO₂ Emissions Reduction Potential

<table>
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<tr>
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<tbody>
<tr>
<td>Peat</td>
<td>4.2</td>
<td>5.7</td>
<td>9.9</td>
</tr>
<tr>
<td>Coal</td>
<td>3.5</td>
<td>4.7</td>
<td>8.2</td>
</tr>
<tr>
<td>Oil</td>
<td>3.0</td>
<td>4.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Average Mix</td>
<td>1.9</td>
<td>2.6</td>
<td>4.5</td>
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<tr>
<td>Gas – Simple Cycle</td>
<td>1.9</td>
<td>2.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Gas – CCGT</td>
<td>1.3</td>
<td>1.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Gas - CHP</td>
<td>0.9</td>
<td>1.2</td>
<td>2.1</td>
</tr>
</tbody>
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Note: Assumes total generating capacity of available wood biomass displaces equivalent capacity of each fuel
Failure to surrender allowances will result in a fine of €40/tonne of CO₂ in the pilot phase, and €100/tonne of CO₂ in the Kyoto phase (from 2008).

What then is the cost of NOT utilising our biomass potential?
CO₂ Emissions Reduction Potential

Value of emissions reductions € million

Fuel Type Displaced by Wood Biomass

Peat  Coal  Oil  Average Fuel Mix  Gas – Simple Cycle  Gas – CCGT  Gas – CHP

€10/tCO₂  €20/tCO₂  €40/tCO₂  €100/tCO₂
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