BioGrace

Harmonised GHG calculations for electricity, heating and cooling from biomass

John Neeft
NL Agency
3rd Joint Workshop on Extending the RED Sustainability Requirements to Solid Bioenergy
29 June 2012, Uppsala
Contents

1. Introduction
2. LCAs: Science versus policy implementation
3. BioGrace-II activities
4. Role of policy makers
5. More information?
6. Concluding summary
BioGrace started as IEE project in 2010
In 2010-2012, BioGrace-I has
- Produced a user-friendly tool for biofuels
- Harmonised calculations
- Send in tool for recognition as “voluntary scheme”
  - Excel tool
  - Calculation rules
  - User manual
Since April 2012: BioGrace-II
- (mainly) GHG calculations for electricity and heat from solid, gaseous and liquid biomass
Contents

1. Introduction
2. LCAs: Science versus policy implementation
3. BioGrace-II activities
4. Role of policy makers
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LCAs: science versus policy implementation

Scientific discussions

European Legislation
- RED & FQD, COM(2010)11
- Communications & Decisions

GHG Methodological aspects
- General methodology
- Detailed calculation rules

Data
- Generic models and data (LUC)
- Standard values

Results
- Default values
- Details on default values

BioGrace
- Economic operator
- Input data
- Actual values

Input data
- Actual values

Slide 5
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www.biograce.net
LCAs: science versus policy implementation

- Some current discussions are so far only scientific
  - Forest carbon stock changes
  - Indirect land use change
- BioGrace will not include such topics in tools before policy makers have decided (based on scientific input)
  - To include the issues into legislation
  - To amend the GHG calculation methodology

BioGrace follows Commission and JRC and makes decisions implementable for stakeholders
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BioGrace-II activities

- BioGrace-II will
  - Explain methodology and add calculation rules e.g. National or EU electricity mix
  - Build GHG calculation tool for electricity, heat and cooling
  - Discuss with policy makers on harmonisation
  - Organise stakeholder feedback and workshops
  - Train verifiers to verify actual GHG calculations

- Small part of work is still on biofuels
  - Verifier trainings
  - Update of biofuel tool after update of RED Annex V

- Some details of work depend on new biomass sustainability report - follow-up of COM(2010)11
BioGrace-II activities

- GHG calculation tool aiming at
  - Make transparent the default values from COM(2010)11
  - Allow stakeholders to make actual calculations

ANNEX II  Typical and default values for solid and gaseous biomass if produced with no net carbon emissions from land use change

<table>
<thead>
<tr>
<th>Primary solid and gaseous biomass pathways</th>
<th>Typical greenhouse gas emissions (gCO₂eq/MJ)</th>
<th>Default greenhouse gas emissions (gCO₂eq/MJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood chips from forest residues (European temperate continental forest)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wood chips from forest residues (tropical and subtropical forest)</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>Wood chips from short rotation forestry (European temperate continental forest)</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
### BioGrac-e-II activities

**Build GHG calculation tool for electricity, heat and cooling**

### Overview Results

<table>
<thead>
<tr>
<th>Production of Electricity, Heat and Cooling from Wood pellets from EU forest residues (natural gas)</th>
</tr>
</thead>
</table>

#### Overview Results

<table>
<thead>
<tr>
<th>Phase</th>
<th>Wood chipping</th>
<th>Quantity of product</th>
<th>Calculated emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>1.0 ton wood chips / 1 ton forest residues, input</td>
<td>1.00 MJ forest residues, input (allocated)</td>
<td>g CO₂ / MJ Wood pellets</td>
</tr>
<tr>
<td>Moisture content</td>
<td>50%</td>
<td>15.00 MJ forest residues, input (non-allocated)</td>
<td>g CH₄ / MJ Wood pellets</td>
</tr>
<tr>
<td>Energy consumption</td>
<td>0.068 kg straw bales / MJ straw pellets</td>
<td>0.068 kg straw bales / MJ straw pellets</td>
<td>g N₂O / MJ Wood pellets</td>
</tr>
</tbody>
</table>

#### Calculation per phase

<table>
<thead>
<tr>
<th>Wood chipping</th>
<th>Quantity of product</th>
<th>Calculated emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>1.0 MJ forest residues, input (allocated)</td>
<td>g CO₂ / MJ Wood pellets</td>
</tr>
</tbody>
</table>

#### Allocation factors

<table>
<thead>
<tr>
<th>Production chain</th>
<th>100.0% to energy carrier</th>
<th>0.0% to co-product(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>65.7% to electricity</td>
<td>34.3% to heat</td>
</tr>
</tbody>
</table>

#### Conversion efficiencies

<table>
<thead>
<tr>
<th>Process</th>
<th>34.0% electrical efficiency</th>
<th>50.0% thermal efficiency</th>
<th>30.0% cooling efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>150 Temp of useful heat (°C)</td>
<td>65.7% to electricity</td>
<td>34.3% to heat</td>
</tr>
</tbody>
</table>

#### Emission reduction

<table>
<thead>
<tr>
<th>Process</th>
<th>66% for electricity</th>
<th>73% for heat</th>
<th>100% for cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>g CO₂ / MJ Wood pellets</td>
<td>g CO₂ / MJ Wood pellets</td>
<td>g CO₂ / MJ Wood pellets</td>
</tr>
</tbody>
</table>

When using this GHG calculation tool, the BioGrac-e calculation rules must be respected.
The rules are included in the zip file (containing the complete tool) and also at www.BioGrac-e.net
### BioGrace-II activities

Build GHG calculation tool for electricity, heat and cooling

#### Overview Results

<table>
<thead>
<tr>
<th>All results in</th>
<th>Non-allocated</th>
<th>Total</th>
<th>Actual/Default values</th>
<th>COM(2010)11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>g CO₂eq / MJ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wood pellets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultivation eₚₚ</td>
<td>1.77</td>
<td>1.77</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Wood chipping</td>
<td>1.77</td>
<td>1.77</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Processing eₚₚ</td>
<td>32.40</td>
<td>32.40</td>
<td>32.4</td>
<td></td>
</tr>
<tr>
<td>Wood pellet production</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Transport eₚₚₚ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport of wood chips</td>
<td>0.34</td>
<td>0.34</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Transport of wood pellets</td>
<td>0.27</td>
<td>0.27</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Land use change eₚₚ</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Bonus (restored degraded land)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Eₚₚₚₚ/ₚₚₚₚ + Eₚₚₚₚ + Eₚₚₚₚ</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>34.8</td>
<td>34.8</td>
<td>35.0</td>
<td></td>
</tr>
</tbody>
</table>

When using this GHG calculation tool, the BioGrace calculation rules must be respected. The rules are included in the zip file (containing the complete tool) and also at www.BioGrace.net

### Calculation per phase

#### Wood chips

<table>
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<tr>
<th>Yield</th>
<th>1.0 ton wood chips / ton forest residues, input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture content</td>
<td>50%</td>
</tr>
<tr>
<td>Energy consumption</td>
<td></td>
</tr>
</tbody>
</table>

#### Quantity of product

<table>
<thead>
<tr>
<th>Emissions per MJ Wood pellets</th>
<th>g CO₂eq / MJ Wood pellets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eₚₚₚₚₚ/ₚₚₚₚ + Eₚₚₚₚₚ + Eₚₚₚₚ</td>
<td>101.5</td>
</tr>
<tr>
<td>Eₚₚₚₚₚₚ/ₚₚₚₚₚ + Eₚₚₚₚₚₚ + Eₚₚₚₚₚ</td>
<td>69.0</td>
</tr>
<tr>
<td>Eₚₚₚₚₚₚ + Eₚₚₚₚ + Eₚₚₚₚ</td>
<td>g CO₂eq / MJ Wood pellets</td>
</tr>
</tbody>
</table>

#### Calculated emissions

<table>
<thead>
<tr>
<th>per kg wood</th>
<th>per ha, year</th>
</tr>
</thead>
</table>

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When using this GHG calculation tool, the BioGrace calculation rules must be respected. The rules are included in the zip file (containing the complete tool) and also at www.BioGrace.net
### BioGrace-II activities

**Build GHG calculation tool for electricity, heat and cooling**

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### Production of Electricity, Heat and Cooling from Wood pellets from EU forest residues (natural gas)

#### Overview Results

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<thead>
<tr>
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<th>Actual</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COM(2010)11</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocation</td>
<td>Allocated</td>
<td>results</td>
<td>factor</td>
<td>results</td>
</tr>
<tr>
<td>14</td>
<td>100.0%</td>
<td>1.77</td>
<td>1.77</td>
<td>100.0%</td>
</tr>
<tr>
<td>32.40</td>
<td>100.0%</td>
<td>32.40</td>
<td>32.40</td>
<td>100.0%</td>
</tr>
<tr>
<td>0.00</td>
<td>100.0%</td>
<td>0.00</td>
<td>0.00</td>
<td>100.0%</td>
</tr>
<tr>
<td>0.34</td>
<td>100.0%</td>
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<td>100.0%</td>
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<tr>
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<td>100.0%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>34.8</strong></td>
<td><strong>34.8</strong></td>
<td><strong>35.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### Allocation factors

- **Production chain**
  - Electricity: 100.0% to energy carrier
  - Heat: 0.0% to co-product(s)
  - Cooling: 100.0% to heat

#### Conversion efficiencies

- 34.0% electrical efficiency
- 30.0% thermal efficiency
- 30.0% cooling efficiency
- 150 Temp of useful heat (°C)

#### Emission reduction

- 40% for electricity
- 21% for heat
- 100% for cooling

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### Calculation per phase

#### Wood chips

- **Yield**
  - Wood chips: 1.0 (ton wood chips / ton forest residues, input)

- **Moisture content**
  - 50%

- **Energy consumption**

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BioGrace-II activities

Discuss with policy makers on harmonisation

BioGrace-II will

- Organise policy maker workshops to discuss harmonisation
- Come with clear proposals
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Role of policy makers

Two harmonisation topics
- Calculation rules
  - e.g. National or EU electricity mix
- One list of conversion factors

If other tools exist: ensure that they give same result
- Cooperation from owner of tool is required
- Track record: most biofuel tools were aligned
Role of policy makers

Why discuss with policy makers on harmonisation?

- Stakeholders request for harmonisation
  - On sustainability criteria in general
  - Including detailed issues like details in GHG calculations

- BioGrace-II has intermediary role
  - Between JRC, national governments and experts
  - Build tool and formulate detailed calculation rules

- Policy makers will finally decide
  - Lesson from BioGrace-I: GHG experts cannot cause harmonisation without decisions at policy level
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More information?

- Project coordinator
  Agentschap NL (Agency NL)
  John Neeft
  e-mail: john.neeft@agentschapnl.nl

- Project partners
  - AEBIOM, Europe (Jean-Marc Jossart)
  - BE2020, Austria (Nikolaus Ludwiczek)
  - BIO IS, France (Perrine Lavelle)
  - IFEU, Germany (Horst Fehrenbach)
  - STEM, Sweden (Anders Dahlberg)
  - VREG, Belgium (Jimmy Loodts)

- Involvement from
  - JRC & LBST, EURELECTRIC, DECC, CWAPE
More information?

- All information is available:
  - and is for free
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Concluding summary

- BioGrace is about implementation of policies
  - Practical tools helping stakeholders to make actual calculations
  - Strictly following European legislation
  - Strongly aiming to create a harmonised European market

- BioGrace-I on biofuels has been finalised
  - GHG calculations for liquid biofuels only
  - Tool has been send in for recognition as a voluntary tool

- BioGrace-II on electricity and heat from biomass just started
  - Harmonise GHG calculations for bio-electricity and bioheat
  - Strong parallels with BioGrace-I but also differences
  - Important role for policy makers
Thank you for your attention

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