

## RED Greenhouse gas emission savings of pyrolysis oil produced by the Empyro pyrolysis plant

### Summary

The directive 2009/28/EC on the promotion of the use of energy from renewable sources (RED) contains requirements to the minimum greenhouse gas emission saving from the use of biofuels and bioliquids. Only bioliquids and biofuels that meet these requirements will be taken into account to national targets, renewable energy obligations and be eligible for financial support for the consumption of biofuels and bioliquids

In this report the greenhouse gas emissions and savings of pyrolysis oil produced from forest residues, A-wood and B-wood have been calculated, following the method as presented in the RED. Table 1 shows the total emissions of pyrolysis oil production, transport and distribution. In the last row the values have been corrected for the production of co-products, i.e. part of the emissions of the pyrolysis factory can be attributed to the production of the co-products steam and electricity.

**Table 1 Total emissions from the production of pyrolysis oil (gram CO<sub>2</sub>-eq/MJ pyrolysis oil)**

Transport	Forest residues	A-wood	B-wood
Pyrolysis oil production	5.89	5.57	8.60
Transport and distribution	4.14	3.61	4.16
<b>Total emission</b>	<b>10.03</b>	<b>9.18</b>	<b>12.76</b>
<b>Total emission (after attribution of emissions to co-production of heat and electricity)</b>	<b>8.70</b>	<b>7.04</b>	<b>8.67</b>

The greenhouse gas emission savings are determined by use of the following formula (RED Annex V, part C, point 4):

$$\text{SAVING} = (E_F - E_B)/E_F$$

With:

$E_B$  = total emissions from the biofuel or bioliquid

$E_F$  = total emissions from the fossil fuel comparator

According to the RED, the following standardised fossil fuel comparators can be used:

$E_F$  electricity = 91 g CO<sub>2</sub>-eq/MJ

$E_F$  heat = 77 g CO<sub>2</sub>-eq/MJ

$E_F$  cogeneration = 85 gCO<sub>2</sub>-eq/MJ.

Table 2 shows the resulting emission savings from the use of pyrolysis oil from wood residues, A-wood and B-wood.

**Table 2 Emission savings from the use of pyrolysis oil**

Emission savings	Fresh wood residues	A-wood	B-wood
Pyrolysis oil replaces electricity	90.4%	92.3%	90.5%
Pyrolysis oil replaces heat	88.7%	90.9%	88.7%
Pyrolysis oil replaces CHP	89.8%	91.7%	89.8%

**The resulting emissions savings are well above the minimum values of 35%, 50% (from 2016 on) and 60% (from 2017 on) as stated in RED article 17.**