



Sustainable Biomass Partnership

Standard #5. Standard for the Collection of Data with the Purpose of Energy and Carbon Balance Calculation

Version 1-1. March 2014



1 Introduction

2 This document lists the data to be collected and forwarded through the supply chain, as well as the
3 different options for collecting and calculating data. All data submitted have to be supported by
4 appropriate evidence.

5 For each reporting item, different tiers are defined. They are defined as followed:

- 6 - Tier 1: **default value** defined by this standard,
- 7 - Tier 2: **regional data**, supported by statistics or literature
- 8 - Tier 3: individual, **operator-specific data**

9 All 3 tiers are not always available for all items. Sometimes, different methodologies are available
10 within one tier (e.g. tier 3A, 3B, 3C), depending on available information.

11 This standard defines the minimum tier that the operator has to use. Where the standard defines it is
12 permitted to use a lower tier. Higher tiers may always be used when the data are supported by
13 appropriate evidence.

14 Reporting period

15 The reporting period has to be specified and the default period is **12 months**.

16 A shorter reporting period can be used in the following circumstances:

- 17 - new production unit, with commissioning completed less than one year ago
- 18 - significant technical changes in the equipment implemented less than 12 months ago
- 19 - significant technical changes in the nature of the raw material implemented less than 12
20 months ago
- 21 - change of ownership (including new operation license held by a different operating
22 company)
- 23 - physical destruction of part of the production facilities and/or of data and related evidence
24 material (e.g. fire)

25 The operator has the opportunity to select a 12 month period which is convenient for recordkeeping
26 (e.g. fiscal year, civil year or any other 12 month period of time). The operator will update the data
27 no less frequently than every 12 months. Data for a reference period ending more than 15 months
28 ago are not suitable unless the plant is started again after a prolonged period (greater than 6
29 months). In this case the most recent activity period available shall be used.

30 An offset of maximum 15 days is allowed between the reporting period and any of the timeframe
31 related to any reported activity data. If, for any of the activity data, the total number of days is not
32 exactly the same as the reference period and reported activity does not cover exactly 12 months (e.g.
33 because of the dates of meter reading, or inventory/invoicing periods) an adjustment to 12 months
34 has to be performed, using a simple proportional relationship.



35 Example:

36 The chosen reference period is civil year 2013.

37 If power invoices are available for the period 20 December 2012 to 20 December 2013, they
38 can be used without any adjustment.

39 If power invoices are available for the period 27 December 2012 to 20 December 2013, the
40 power used will need to be adjusted as: $\times 365 / 358$.

41 Power invoices for the period 12 December 2012 to 12 December 2013 are not acceptable as
42 long as the civil year 2013 is the reference period. If available, invoices for the period 12
43 January 2013 to 12 January 2014 will be more appropriate. Alternatively the reporting period
44 May be changed so that the available power invoices are consistent.

45

Draft for consultation



46 **1. Input materials for wood pellet production:**

47 Each raw material origin has to be described under item 1.1 or 1.2 or 1.3, as specified below.

48 **1.1. FOREST PRODUCTS (Primary Woody Biomass)**

49 This category includes primary wood harvested from forest, thinnings from forests and wood
50 harvested from short rotation systems.

51 1.1.1. Supplier name

52 A number can be used instead of the name. The name must be made available to the auditor
53 during the certification audit, but does not need to be referenced in the self reporting file
54 communicated throughout the supply chain.

55 1.1.2. State of product when delivered to the pellet plant

56 Select from the following categories:

- 57 ○ logs
- 58 ○ chips
- 59 ○ other (specify)

60 1.1.3. Feedstock weight per year

61 This is the total of all deliveries of raw material to the production site during the reference
62 period. In case part of this raw material is diverted from the process to be used internally as
63 fuel: if this amount is reported under 1.1.3, it must not be reported in 2.11. The operator
64 makes sure this amount is not double reported, nor is it omitted.

65 Tier 3: Input material is delivered by truck and goes through a weighbridge. The weighbridge
66 entries are recorded in a database and include at least: supplier name, nature of the
67 material, date, weight. The total amount material per year and per supplier can be calculated
68 from an extract of the database for the reference period.

69 1.1.4. Average moisture content

70 Tier 3B: There is one measurement of moisture content for each delivery of raw material
71 batch (trucks) and/or regular measurement for continuous delivery of raw material
72 (conveying system). All the measurements are recorded in a database. A weighted average is
73 computed.

74 Tier 3A: There are occasional measurements. An approximate average value can be provided
75 per category of feedstock.

76 When raw material is round wood no measurement of moisture can be done. In this case,
77 the moisture content has to be reported under this item. The moisture content after the logs
78 are debarked and processed to chips has to be reported under item 2.2.



79 1.1.5. Fuel use for forestry

80 This item includes energy used for soil preparation, plantation, forest management,
81 harvesting. Chipping (if applicable) should be reported separately (item 1.1.8).

82 As energy expenses in forestry are difficult to monitor, tier 1 or 2 can be used instead of tier
83 3.

84 Tier 3: All the fuel use throughout the rotation period is reported. The amount is divided by
85 the total amount of wood harvested during the rotation period (litre fuel / mt round wood)

86 Tier 2: If there are specific data based on statistics for the relevant region, they can be used.

87 Tier 1: A default value can be used instead by the operators: 1.67 litre diesel / mt round
88 wood (computed from Biograce)

89 Conversion factors (Biograce):

- 90 ○ diesel density : 0.832 kg/litre
- 91 ○ diesel LHV : 43.1 MJ/kg

92 1.1.6. Fertilizer use in forestry (if applicable)

93 Tier 3: The doses of fertilizer applied on the land throughout the rotation period need to be
94 reported in kg fertilizer/mt harvested wood (taking into account the total amount of wood
95 harvested during the rotation period). Each type of fertilizer has to be reported separately,
96 e.g. N, P₂O₅ and K₂O. Other types of fertilizer and other components of fertilizers do not need
97 to be reported.

98 Tier 1: Fertilizer is rarely used in forestry, except in short rotation systems. In traditional
99 forestry, the default will be 0. In short rotation systems, the values from Biograce can be
100 used.

101 1.1.7. Pesticides use in forestry (if applicable)

102 Tier 3: The dose of pesticide used in the forest throughout the reporting period needs to be
103 reported in kg active substance/mt harvested wood (taking into account the total amount of
104 wood harvested during the rotation period). The concentration of the active substance is
105 taken into account in the calculation.

106 Tier 1: The default value from Biograce can be used: 0.07654 kg/mt round wood

107 This value has been established for short rotation systems but can also conservatively be
108 applied to traditional forestry.

109 1.1.8. Diesel (or electricity) use for external chipping (if applicable)

110 To be reported in litre diesel / mt chips (or in kWh/mt chips in case of electricity).

111 Tier 3: The operator can calculate the specific energy use for chipping the round wood
112 through field tests (intensive monitoring of the performances of machinery during at least
113 one day) or throughout the year.

114 Tier 1: A default value can be used instead by the operators:



115 0.524 litre diesel /metric ton chips (computed from Biograce)

116 Conversion factors (Biograce):

117 ○ diesel density : 0.832 kg/litre

118 ○ diesel LHV : 43.1 MJ/kg

119 1.1.9. Diesel for truck haulage to Pellet Plant

120 The diesel use is reported in litres/metric ton feedstock, for each category of feedstock.

121 Tier 3B: The amount of diesel used is monitored and can be demonstrated based on actual fuel
122 records (tank level and uplifts) along the relevant travel route with vehicles of the relevant
123 fleet. Return empty is taken into account (unless demonstrably not applicable).

124 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
125 also to be reported.

126 Tier 3A: The amount of diesel used is estimated with fuel efficiency factor, which is specifically
127 demonstrated for the types of vehicles used on the relevant travel route. Return empty is
128 taken into account (unless demonstrably not applicable). All details of the fuel monitoring are
129 recorded and available for inspection.

130 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
131 also to be reported.

132 Tier 2: The amount of diesel used by the truck is not monitored, but the fuel consumption is
133 calculated with a fuel efficiency factor retrieved from recent publication for the relevant
134 region.

135 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
136 also to be reported.

137 Tier 1: A conservative fuel efficiency is considered for standard trucks (40 tons) loaded with
138 chips (Biograce): $0.97 \text{ MJ} / \text{tkm} = 0.026985 \text{ litre diesel} / \text{tkm}$ (those values include a return
139 empty).

140 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
141 also to be reported.

142 All 3 tiers are acceptable and can be used by the pellet producer.

143 For all tiers: if blending of biodiesel is compulsory in the relevant region or otherwise
144 demonstrated to be systematically used by the haulage company on the defined route, the
145 share of biofuel can be reported separately.



146 **1.2. FOREST RESIDUES (Primary biomass)**

147 Regardless if the material is chipped in forest or elsewhere, this category includes branches,
148 low quality wood, diseased trees, dead wood, storm wood.

149 1.2.1. Supplier name

150 A number can be used instead of the name. The name must be made available to the auditor
151 during the certification audit, but does not need included in the self reporting file
152 communicated throughout the supply chain.

153 1.2.2. State of product when delivered to the pellet plant

154 Select from the following categories:

- 155 logs
- 156 chips
- 157 other (specify)

158 1.2.3. Feedstock weight per year

159 This is the total of all deliveries of raw material to the production site during the reference
160 period. In case part of this raw material is diverted from the process to be used internally as
161 fuel: if this amount is reported under 1.2.3, it must not be reported in 2.11. The operator
162 makes sure this amount is not double reported, nor is it omitted.

163 Tier 3: Input material is delivered by truck and goes through a weighbridge. The weighbridge
164 entries are recorded in a database and include at least: supplier name, nature of the material,
165 date, weight. The total amount material per year and per supplier can be calculated from an
166 extract of the database for the reference period.

167 1.2.4. Average moisture content

168 Tier 3B: There is one measurement of moisture content for each delivery of raw material batch
169 (trucks) and/or regular measurement for continuous delivery of raw material (conveying
170 system). All the measurements are recorded in a database. A weighted average is computed.

171 Tier 3A: There are occasional measurements. An approximate average value can be provided
172 per category of feedstock.

173 When raw material is round wood, no measurement of moisture can be done. In this case, the
174 moisture content has to be reported under this item. The moisture content after the logs are
175 debarked and processed to chips has to be reported under item 2.2.

176 1.2.5. Diesel (or electricity) use for external chipping (if applicable)

177 To be reported in litre diesel / mt chips (or in kWh/mt chips in case of electricity).

178 Tier 3: The operator can calculate the specific energy use for chipping the round wood through
179 field tests (intensive monitoring of the performances of machinery during at least one day) or
180 throughout the year.



181 Tier 1: A default value can be used instead by the operators:
182 0.524 litre diesel /metric ton chips (computed from Biograce)

183 Conversion factors (Biograce):
184 ○ diesel density : 0.832 kg/litre
185 ○ diesel LHV : 43.1 MJ/kg

186 1.2.6. Diesel for truck haulage to Pellet Plant

187 The diesel use is reported in litres/metric ton feedstock, for each category of feedstock.

188 Tier 3B: The amount of diesel used is monitored and can be demonstrated based on actual fuel
189 records (tank level and uplifts) along the relevant travel route with vehicles of the relevant
190 fleet. Return empty is taken into account (unless demonstrably not applicable). All details of
191 the fuel monitoring are recorded and available for inspection. Besides the actual fuel
192 consumption, the distance in km and the average load of the trucks has also to be reported.

193 Tier 3A: The amount of diesel used is estimated with fuel efficiency factor, which is specifically
194 demonstrated for the types of vehicles used on the relevant travel route. Return empty is
195 taken into account (unless demonstrably not applicable).

196 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
197 also to be reported.

198 Tier 2: The amount of diesel used by the truck is not monitored, but the fuel consumption is
199 calculated with a fuel efficiency factor retrieved from recent publication for the relevant
200 region.

201 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
202 also to be reported.

203 Tier 1: A conservative fuel efficiency is considered for standard trucks (40 tons) loaded with
204 chips (Biograce): 0.97 MJ / tkm = 0.026985 litre diesel / tkm (those values include a return
205 empty).

206 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
207 also to be reported.

208 All 3 tiers are acceptable and can be used by the pellet producer.

209 For all tiers: if blending of biodiesel is compulsory in the relevant region or otherwise
210 demonstrated to be systematically used by the haulage company on the defined route, the
211 share of biofuel can be reported separately.



212 **1.3. SAWMILL OR WOODWORKING RESIDUES (Secondary biomass)**

213 This category includes sawdust, shavings, offcuts and chips resulting as by-product from the
214 normal calibrating and cutting of roundwood in fixed permanent facilities.

215 1.3.1. Supplier name

216 A number can be used instead of the name. The name must be made available to the auditor
217 during the certification audit, but does not need to be included in the self reporting file
218 communicated throughout the supply chain.

219 1.3.2. State of product when delivered to the pellet plant

220 Select from the following categories:

- 221 sawdust
- 222 shavings
- 223 barks
- 224 offcuts
- 225 sawmill chips
- 226 other (specify)

227 1.3.3. Feedstock weight per year

228 This is the total of all deliveries of raw material to the production site during the reference
229 period. In case part of this raw material is diverted from the process to be used internally as
230 fuel: if this amount is reported under 1.3.3, it must not be reported in 2.11. The operator
231 makes sure this amount is not double reported, nor is it omitted.

232 Tier 3A: Input material is delivered by truck and goes through a weighbridge. The weighbridge
233 entries are recorded in a database and include at least: supplier name, nature of the material,
234 date, weight. The total amount material per year and per supplier can be calculated from an
235 extract of the database for the reference period.

236 Tier 3B: Input material transported to site by blowpipe, transport band or conveyor belt from a
237 neighboring location is quantified by on line measurement devices and/or by invoices of the
238 raw material supplier.

239 1.3.4. Average moisture content

240 Tier 3B: There is one measurement of moisture content for each delivery of raw material batch
241 (trucks) and/or regular measurement for continuous delivery of raw material (conveying
242 system). All the measurements are recorded in a database. A weighted average is computed.

243 Tier 3A: There are occasional measurements. An approximate average value can be provided
244 per category of feedstock.

245 1.3.5. Diesel for truck haulage to Pellet Plant

246 The diesel use is reported in litres/metric ton feedstock, for each category of feedstock.



247 Tier 3B: The amount of diesel used is monitored and can be demonstrated based on actual fuel
248 records (tank level and uplifts) along the relevant travel route with vehicles of the relevant
249 fleet. Return empty is taken into account (unless demonstrably not applicable). All details of
250 the fuel monitoring are recorded and available for inspection.

251 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
252 also to be reported.

253 Tier 3A: The amount of diesel used is estimated using a fuel efficiency factor, which is
254 specifically demonstrated for the types of vehicles used on the relevant travel route. Return
255 empty is taken into account (unless demonstrably not applicable).

256 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
257 also to be reported.

258 Tier 2: The amount of diesel used by the truck is not monitored, but the fuel consumption is
259 calculated with a fuel efficiency factor retrieved from recent publication for the relevant
260 region.

261 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
262 also to be reported.

263 Tier 1: A conservative fuel efficiency is considered for standard trucks (40 tons) loaded with
264 chips (Biograce): $0.97 \text{ MJ} / \text{tkm} = 0.026985 \text{ litre diesel} / \text{tkm}$ (those values include a return
265 empty).

266 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
267 also to be reported.

268 All 3 tiers are acceptable and can be used by the pellet producer.

269 For all tiers: if blending of biodiesel is compulsory in the relevant region or otherwise
270 demonstrated to be systematically used by the haulage company on the defined route, the
271 share of biofuel can be reported separately.

272

273 1.3.6. Conveying system from sawmill (or other woodwork facilities) to pellet plant

274 The energy used to evacuate the residues from the sawmill by a conveying system (blowpipe,
275 conveyor belt, transport bands) is considered as part of the normal sawmill operations and
276 does not need to be reported in this framework. The operator needs to mention for which
277 category of feedstock a conveying system is used.



278 **2. Production of wood pellets**

279 **2.1. Total annual quantity of raw materials used in the process**

280 Tier 3B: Where facilities have a direct measurement of the raw material entering the
281 production chain, with a batch metering system, the total of the recorded raw material input
282 can be aggregated throughout the reporting period and is a very direct measurement of the
283 raw material input throughout the year.

284 Tier 3A: Otherwise the amount of raw material entering the supply chain is estimated as
285 follows: total amount of raw material purchased (as per total of 1.1, 1.2 and 1.3) minus the
286 estimated stock variation (if there is known significant difference between the amount of
287 material stored on site at the beginning of the reference period and at the end of the
288 reference period).

289 **2.2. Average moisture content of raw materials entering the production chain**

290 *(not compulsory)*

291 Moisture content of the raw material entering the supply chain might differ from the moisture
292 recorded at the gate, as moisture content can vary during storage (exposure to rain, natural
293 drying in the open air ...).

294 If the moisture content at the start of the production chain is monitored, it has to be reported
295 here. If item 2.1 is reported using tier 3A, then it is compulsory to fill in item 2.2. Otherwise it
296 is optional, as not all pellet producers have a moisture measurement at the input of the
297 process.

298 When raw material round wood, initial moisture will be considered after the logs are debarked
299 and processed to chips.

300 Tier 3C: There is a continuous measurement of the moisture at the start of the production
301 chain. An annual average has to be produced.

302 Tier 3B: There are regular measurements of moisture at the start of the production chain. An
303 annual average has to be produced.

304 Tier 3A: There are occasional moisture measurements of moisture at the start of the
305 production chain. An estimation of the average can be provided as a guide, based on those
306 occasional measurements. The moisture content can be reported as a weighted average
307 throughout all categories of raw materials or as an average for each type of raw material.

308 **2.3. Average moisture content at the exit of the dryer**

309 *(not compulsory)*

310 If the moisture content at the exit of the dryer is monitored, it has to be reported here.

311 Tier 3C: There is a continuous measurement of the moisture at the exit of the dryer. An annual
312 average has to be produced.



313 Tier 3B: There are regular measurements of moisture at the exit of the dryer. An annual
314 average has to be produced.

315 Tier 3A: There are occasional moisture measurements of moisture at the exit of the dryer. An
316 estimation of the average can be provided as a guide, based on those occasional
317 measurements.

318 **2.4. Average moisture content of produced wood pellets**

319 The moisture content of the pellets (at the pellet plant gate) needs to be reported.

320 Tier 3C: There is a continuous measurement of the moisture of the pellets. An annual average
321 has to be produced.

322 Tier 3B: There are regular measurements of moisture of the pellets. An annual average has to
323 be produced.

324 Tier 3A: There are occasional moisture measurements of moisture of the pellets. An estimation
325 of the average can be provided as a guide, based on those occasional measurements.

326 **2.5. Total annual amount of electricity used for production of wood pellets**

327 Tier 3 has to be used and the electricity used by the pellet production is to be reported in kWh
328 used during the reference period

329 Where the power consumption of the related facilities (e.g. offices, cafeteria, workshop, site
330 lighting, lab) are included in the consumption measured by the meter they may be left in. If a
331 separated meter makes it possible to exclude the related facilities, the producer can decide to
332 exclude the consumptions of those facilities from the reported figure or to leave them in.

333 Tier 3C: The electricity used by the pellet plant is from an external supplier. The meter(s) used
334 by the supplier for invoicing purposes cover exclusively the pellet production process (and
335 possibly other facilities related to the process). The amount of electricity used during the
336 reference period is based on invoices of external power supplier.

337 Tier 3B: The electricity used by the pellet plant is from an external supplier. The meter(s) used
338 for invoicing purposes covers not only the pellet production process (possibly including related
339 facilities), but also other process lines (e.g. sawmill or other productions).

340 ○ If additional (internal) meters are available, then internal meter readings performed
341 at the beginning and at the end of the reporting period can be used to determine the
342 share of the invoiced power to be allocated to the pellet production.

343 ○ If such additional meters are not available, then a theoretical approach can be
344 proposed to allocate the power to the different uses. The approach can be based on:
345 ■ installed power of the machinery within the different chains,
346 ■ number of operating hours of the different production chains,



- 388
- 389
- 390
- 391
- I=kWh power imported from outside
 - PP=kWh power used for internal pellet production
 - OP=kWh power used in other internal production lines
 - PP = P+I-A-EG-OP

392 **2.7. Total annual amount of diesel (or heating oil) used for production**

393 Diesel or heating oil used by machinery and/or vehicle is to be reported in litres/year.

394 Tier 3D: There is a diesel tank on site used exclusively for the purpose of wood pellet
395 production. All deliveries throughout the year have been recorded. The level of the tank at the
396 beginning and at the end of the reference period is known. The reported amount of diesel is
397 the sum of all deliveries plus initial contents of the tank, minus final contents of the tank.

398 Tier 3C: There is a diesel tank on site used exclusively for the purpose of wood pellet
399 production. All deliveries throughout the year have been recorded. The level of the tank at the
400 beginning and at the end of the reference period is unknown. The reported amount of diesel is
401 the sum of all deliveries.
402

403 Tier 3B: There is a diesel tank on site but it is not dedicated to the pellet production. Some
404 vehicles/machinery unrelated to the pellet production also use diesel from the same tank. A
405 log book, an electronic code/card system or a similar system is in place to allocate the fuel use
406 to one or another process.

407 Tier 3A: The diesel tank is shared without possibility to record use for each process, or the
408 diesel used on site is brought by a subcontractor without any possibility for the pellet plant to
409 record fuel use or to access invoices. The specific (hourly) fuel use of the machinery used is
410 known (demonstrated by technical specifications) and the number of operating hours is known
411 (based on the work schedule and/or data loggers installed on machinery). The annual
412 consumption is calculated accordingly.

413 In some case, the diesel used on site might be the total of different components, each of them
414 approached with a different tier.

415 Tier 1: There is no possibility to keep track of the diesel use through deliveries or through
416 hourly fuel use of the relevant machinery. The following conservative default can be used
417 instead:

- 418 handling: 1.5 litres / ton pellets
419 chipping logs : 2.5 litres / ton pellets.

420 Tier 1 is also to be used for new pellet plant where no records are available.

421 Conversion factors (Biograce):

- 422 ○ diesel density : 0.832 kg/litre
423 ○ diesel LHV : 43.1 MJ/kg



424 **2.8. Total annual amount of Liquid Propane Gas used for production**

425 Propane used by machinery and/or vehicles is to be reported by litres/year

426 Tier 3B: There is a fixed propane tank on site or individual propane bottles. The use throughout
427 the reference period is based on the sum of all tank refill or bottle purchase.

428 Tier 3A: The propane tank/bottles are not for the exclusive use of the pellet production. The
429 amount of propane used is calculated based on hourly use of the equipments and related
430 number of operating hours, or alternatively through a justified allocation mechanism of the
431 total amount of propane purchased through the different uses.

432 Conversion factors: (<http://encyclopedia.airliquide.com/Encyclopedia.asp?GasID=53>)

- 433 ○ liquid propane density : 582 kg/m³
- 434 ○ propane LHV: 45.8 MJ/kg.

435 **2.9. Total annual amount of natural used for production**

436 Natural gas is to be reported in kWh/year, in terms of lower heating value

437 Tier 3B: The natural gas is for the use of the pellet production only and invoiced in kWh by the
438 supplier. The total invoiced amount per year is reported.

439 Tier 3A: The natural gas as invoiced by the supplier is not for the exclusive use of the pellet
440 production. The amount of natural gas used is calculated based on hourly use of the
441 equipments and related number of operating hours, or alternatively through a justified
442 allocation mechanism of the total amount of natural gas purchased through the different uses.

443 Conversion factor:

444 HHV/LHV ratio for natural gas = 1.1

445 This conservative conversion factor has to be used when natural gas is invoiced/monitored in
446 HHV and has to be converted into LHV for the purpose of this reporting.

447 **2.10. Any other fossil fuel**

448 Any other fossil fuel involved in the production has to be reported. The amount is to be
449 reported in kg or litres per year, based on the supplier invoices or other appropriate
450 monitoring.

451 **2.11. Nature of the biomass used in dryer (or CHP)**

452 The operator should describe the biomass used in the process through the use of the following
453 categories:

454 A. Biomass derived from the pellet process



- 455 a. dry fines
456 b. fresh fines
457 c. barks
458 d. spoiled pellets
459 e. fresh chips
460 f. dried chips
461 g. dried sawdust/shavings
- 462 B. Biomass residue from sawmill and other wood working activities
463 a. sawdust
464 b. shavings
465 c. offcuts
466 d. sawmill chips
467 e. barks
- 468 C. Biomass harvested from forest
469 a. logs/thinnings
470 b. chipped logs/thinnings
471 c. chipped forest residues
- 472 D. Post consumer wood
- 473 E. Non woody biomass (specify)

474 **2.12. Annual amount of biomass used in dryer (or CHP)**

475 Each type of biomass (as described in 2.11) has to be reported separately, in metric tons per
476 year.

477 Tier 3B: The biomass to be used specifically as fuel in the dryer (or in the CHP) is shipped
478 separately, stored separately and recorded separately in the bookkeeping. Each delivery is
479 recorded in a database (with details including: weight, supplier name, date, nature). Each type
480 of biomass fuel is reported as the total of all deliveries throughout the year.

481 Tier 3A: The biomass to be used as fuel in the dryer is diverted from the pelletizing process at
482 some stage (debarking, milling, sieving, etc). This biomass has to be reported separately. The
483 total amount of each material stream throughout the reference period is
484 It is possible that part of the biomass fuel for the boiler is specifically sourced (tier 3B) and
485 another part derived from the process (tier 3A)

486 **2.13. Average moisture content of biomass used in dryer (or CHP)**

487 Each category of biomass fuel reported in 2.11, using tier 3B has to be reported here, unless a
488 weighted average at the entrance of the furnace is demonstrated using tier C, in which case
489 one figure is sufficient. The biomass fuel reported in 2.11 using tier 3A does not need to be
490 described here.



491 Tier 3C: There is a continuous measurement of the moisture of the biomass fuel at the
492 entrance of the furnace. An annual average has to be produced.
493 Tier 3B: There is measurement of moisture of the biomass fuel for each delivery of biomass
494 fuel. A weighted annual average has to be produced.
495 Tier 3A: There are occasional moisture measurements of moisture of the biomass fuel. An
496 estimation of the average can be provided as a guide, based on those occasional
497 measurements, for each category of biomass fuel.

498 It is possible that different tiers are used for different categories of biomass fuel.

499 **2.14. Transport of biomass used in the dryer (or CHP)**

500 Each category of biomass fuel reported in 2.11 using tier 3B has to be considered here. The
501 biomass fuel reported in 2.11 using tier 3A does not need to be described here.

502 To be reported:

- 503 ○ distance (from a fixed location) or estimated average distance from variable location
- 504 ○ mode of transport (truck, rail, ship, conveyor system etc.)

505 **2.15. CHP efficiency**

506 If the heat used for the drying process is from a biomass CHP and not from a simple furnace,
507 the following data have to be reported:

- 508 ○ net power production of the CHP (kWh/year)
- 509 ○ heat valorization in the dryers of the pellet lines
- 510 ○ heat valorization for any other purpose (industrial process, district heating etc.)

511 The fuel used in the CHP has to be comprehensively described in items 2.11 to 2.13.

512 **2.16. Total quantity of annual wood pellet production**

513 Tier 3: The quantity of pellets produced during the reference period has to be monitored by
514 the pellet producer at the plant gate (weighbridge) and/or at the end of the production chain.
515 If the production amount is based on the quantity of pellets leaving the plant, then any
516 significant stock variation between the beginning and the end of the production period has to
517 be taken into account.

518 Production logs are the primary information records. Sales figures and transport documents
519 can be used as verification material, as they must be consistent with the production volume
520 (including adjustments reflecting any stock variation).



521 3. Transportation of wood pellets

522 Guidelines are given for each type of transport. Each applicable transport step has to be
523 described. Place of departure and place of arrival is mentioned for each transportation step.
524 Some transport mode might need to be reported several times if used several times in the
525 supply chain.

526 3.1. Truck transport

527 The diesel use is reported in litres/metric ton pellets.

528 Tier 3B: The amount of diesel used is monitored and can be demonstrated based on actual fuel
529 records (tank level and uplifts) along the relevant travel route with vehicles of the relevant
530 fleet. Return empty is taken into account (unless demonstrably not applicable). All details of
531 the fuel monitoring are recorded and available for inspection.
532 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
533 also to be reported.

534 Tier 3A: The amount of diesel used is estimated with fuel efficiency factor, which is specifically
535 demonstrated for the types of vehicles used on the relevant travel route. Return empty is
536 taken into account (unless demonstrably not applicable).
537 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
538 also to be reported.

539 Tier 2: The amount of diesel used by the truck is not monitored, but the fuel consumption is
540 calculated with a fuel efficiency factor retrieved from recent publication for the relevant
541 region.

542 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
543 also to be reported.

544 Tier 1: A conservative fuel efficiency is considered for trucks loaded with pellets (Biograce):
545 $1.01 \text{ MJ / tkm} = 0.028098 \text{ litre diesel / tkm}$ (those values include a return empty).

546 Besides the actual fuel consumption, the distance in km and the average load of the trucks has
547 also to be reported.

548 All 3 tiers are acceptable and can be used by the pellet producer.

549 For all tiers: if blending of biodiesel is compulsory in the relevant region or otherwise
550 demonstrated to be systematically used by the haulage company on the defined route, the
551 share of biofuel can be reported separately.



552 **3.2. Diesel Train transport**

553 The diesel use is reported in MJ/metric ton pellets.

554 Tier 3B: The amount of diesel used is monitored and can be demonstrated based on actual fuel
555 records (tank level and uplifts) along the relevant travel route with the trains actually used.
556 Return empty is taken into account (unless demonstrably not applicable).

557 Besides the actual fuel consumption, the distance in km has also to be reported.

558 Tier 3A: The amount of diesel used is estimated with fuel efficiency factor, which is specifically
559 demonstrated for the type of trains used on the relevant travel route. Return empty is taken
560 into account (unless demonstrably not applicable).

561 Besides the estimated fuel consumption, the distance in km has also to be reported.

562 Tier 2: The amount of diesel used by the truck is not monitored, but the fuel consumption is
563 calculated with a fuel efficiency factor retrieved from recent publication for the relevant
564 region.

565 Besides the estimated fuel consumption, the distance in km has also to be reported.

566 ○ compulsory value for tier 2 in USA:

567 0.25 MJ/tkm = 0.006955 litre diesel/tkm
568 (Biograce 2)

569 ○ compulsory values for tier 2 in Canada:

570 0.00573litre diesel/tkm

(Locomotive Emissions Monitoring Program 2009 by the Railway Association of
Canada)

http://www.railcan.ca/assets/images/publications/LEM/LEM2009eng_rev13.pdf

571 (Those values include the fuel use of the entire rail industry, including the actual proportion of
572 hauling empty railcars).

573 All 3 tiers are acceptable and can be used by the pellet producer.

574 For all tiers: if blending of biodiesel is compulsory in the relevant region or otherwise
575 demonstrated to be systematically used by the haulage company on the defined route, the
576 share of biofuel can be reported separately.

577 For all tiers, the rail distance is reported by the transport company and checked on a map.

578 **3.3. Electric train transport**

579 The power used is reported in kWh/ metric ton pellets.

580 Tier 2: The power consumption of transport by electric trains is calculated with a specific
581 power use (in kWh/tkm) retrieved from recent publication for the relevant region.



582 Besides the estimated fuel consumption, the distance in km has also to be reported..

583 Tier 1: The following default factor can be used for electric train in any region of the world:
584 0.21 MJ/tkm = 0.0583 kWh/tkm (Biograce) (A certain proportion of empty railcars haulage is
585 assumed in this factor.)

586 For all tiers, the rail distance is reported by the transport company and checked on a map.

587 **3.4. River transportation**

588 The amount of fuel is reported in MJ/ metric ton pellets

589 Tier 3B: The amount of fuel used is monitored and can be demonstrated based on actual fuel
590 records (tank level on departure and upon arrival, any fuel uplift underway) along the relevant
591 travel route with the actual vessel used. No return empty is to be taken into account.

592 Besides the actual fuel consumption, the distance in km has also to be reported.

593 Tier 1: The following default value is available:

594 Inland ship 1.2 kt: 0.50 MJ/tkm (Biograce)

595 Besides the estimated fuel consumption, the distance in km has also to be reported.

596 Conversion factor: LHV marine distillate fuel = 43.1 MJ/kg (Biograce value for diesel)

597 For all tiers: transport distance to be declared in written and signed by the transport company.

598 **3.5. Sea transport**

599 The amount of RFO and of marine diesel used by the ships is to be reported in kg fuel/metric
600 ton pellets. Each fuel is to be reported separately.

601 Tier 3B: The amount of fuel used is monitored and can be demonstrated based on actual fuel
602 records (tank level on departure and upon arrival, any fuel uplift underway) along the relevant
603 travel route with the actual vessel used. No return empty is to be taken into account.

604 Besides the actual fuel consumption, the distance in sea miles has also to be reported.

605 Tier 3A: The amount of diesel used is estimated with fuel efficiency factor calculated from the

606 ○ Energy Efficiency Design Index (EEDI) for ships built after 1 January 2013

607 ○ Existing Vessel Design Index (EVDI) for ships built before 1 January 2013

608 Both the EEDI and the EVDI indicates the theoretical GHG emissions (in gramme CO₂) per ton
609 freight and per nautical mile. The EEDI is compulsory for all ships built after 1 January 2013.

610 The EVDI is available for existing ships, even though not compulsory. It comes as a certificate
611 for each individual ship, and is calculated from the technical specifications.



612 EEDI and EVDI do not include any assumption in terms of utilization rate of the vessel: they
613 don't include any emissions from sailing empty (or not fully loaded) before or after loading the
614 cargo.

615 The fuel use (in MJ) is computed as follows from the EEDI or EVDI:
616 $F = E \times D / E_f \times LHV$

617 where:

618 F = amount of fuel (in MJ / ton cargo)

619 E = EEDI or EVDI (in g CO₂/ nautical mile)

620 D = distance (in nautical miles)

621 E_f = emission factor of marine fuel (in g CO₂ / kg fuel)

622 3151.04 g CO₂ / kg fuel for LFO (marine diesel - light fuel oil)

623 3114.4 g CO₂ / kg fuel for RFO (residual fuel oil- heavy/intermediate fuel oil)

624 (as per <http://shippingefficiency.org/userfiles/files/Data-Methodology.pdf>)

625 LHV= lower heating value of the fuel (in MJ / kg fuel)

626 In addition to the estimated fuel consumption the distance in sea miles as well as the type of
627 fuel(s) used by the vessel are to be calculated and reported.

628 Unless more accurate information is available, the fuel will be assumed to be 100% RFO for all
629 intercontinental journeys and LFO for all intracontinental journeys.

630 Tier 1: The following default values are available:

631 ○ Panamax (60000 – 75000 mt) : 0.10 MJ / tkm (Biograce)

632 ○ Supramax (40 000-60 000 mt): TBC

633 ○ Handysize (15 000-40 000 mt) : 0.12 MJ/tkm (Biograce)

634 ○ Coasters (<15000 mt) TBC

635 For all tiers: the distances between harbours are calculated with the following on-line distance
636 calculator: AXS Marine (<http://www.axsmarine.com/distance/>)

637 Conversion factors:

638 ○ LHV residual fuel oil: 40.5 MJ/kg (Biograce)

639 ○ LHV marine distillate fuel : 43.1 MJ/kg (Biograce value for diesel)

640 ○ 1 sea mile = 1.852 km

641 3.5.1. Wood pellet storage, handling and transshipment

642 The fuel and power used at the different storage, handling and transshipment locations has
643 to be reported. When no individual data are available (tier 3), default values can be used (tier
644 1).

645 Energy expenses include the following operations:

646 ○ vehicles (front end loaders, switch engines...)

647 ○ truck dippers

648 ○ fans

649 ○ conveying/loading/stacking systems



650 Diesel to be reported in litres/ metric ton pellet. Electricity to be reported in kWh/metric ton
651 pellet.

652 Tier 3B: A yearly overview of the amount of pellets that have been through the facilities is
653 available, as well as the annual fuel and/or power use. Supporting material includes fuel
654 invoices, power invoices, meter readings, fuel logbook. The operator calculates the specific
655 consumption during a reference period.

656 Tier 3B: for some equipment, a yearly overview of the consumptions might be not available or
657 not relevant. In this case, the operator has to rely on hourly fuel/power use of the equipment
658 to calculate the energy use per metric tonnes pellets.

659 Transport systems at the power plant are out of scope if they are included in the production
660 auxiliaries (and hence, excluded from the net power production and net efficiency).

661

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662 **4. End-user of wood pellets (power plant)**

663 **4.1. If the pellets are used in power plant**

664 4.1.1. Net electric efficiency of the power plant

665 Net power production of the CHP / primary energy of fuel used in the CHP

666 NB : net power production excludes auxiliaries

667 **4.2. If the pellets are used in a CHP:**

668 4.2.1. Net electric efficiency of the CHP

669 Net power production of the CHP / primary energy of fuel used in the CHP

670 4.2.2. Global efficiency of the CHP

671 (valorized heat + net power production) / primary energy of fuel

672 **▪ Lower heating value of the pellets**

673 To be reported in MJ/kg and to be supported by regular analysis of the pellets received.

674 Analysis reports are retained as supporting evidence.

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