

1982  
in  
Mora



The  
first  
step

Once up on time ..

Pictures removed



+



Pictures removed

The first steps of a  
fantastic journey

2007-05-06

## The Pellets Map

Every year  
a new updated  
Pellets Map.  
In Dec. 2006 we  
listed 285 larger  
pellets production  
plants in Europe.  
The development  
is very fast.



2007-05-06

## By the way this is me

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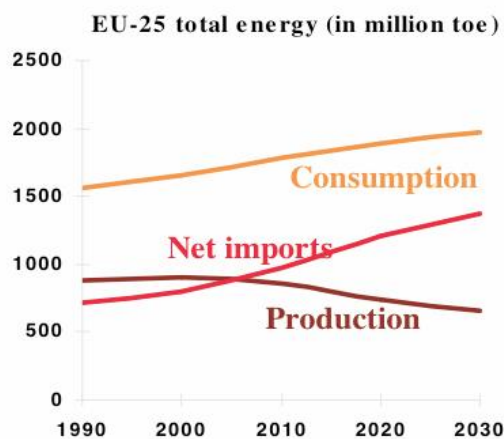


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## One must never forget the EU basic driving force

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If this will become reality emissions of Carbon dioxide can be 5 % higher 2012 instead of the shared burden of the Kyoto agreement that says 8 % lower for EU!!

This will be taken care of with political instruments!

•Green paper emphasis

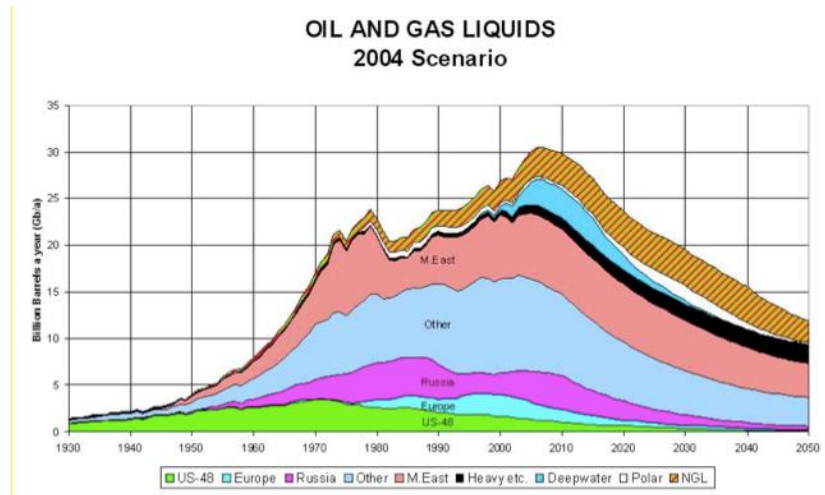
- 1) Competitiveness
- 2) Sustainability
- 3) Security of supply

•Bioenergy will under the right conditions fulfill all these goals.

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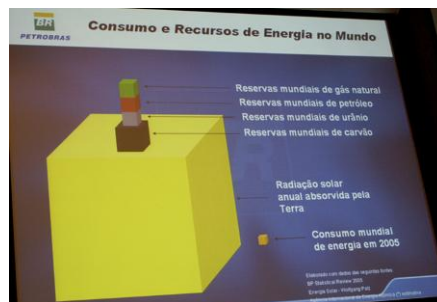
# The fossil peak is reached



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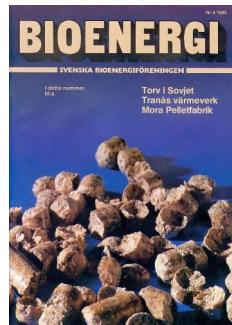
# But fortunately the opportunities are great



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## Let us move 25 years back



1982 - 85 there was a boom in wood pellet development in Sweden.

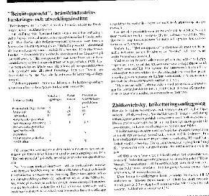
This issue of Swedish Bioenergi was printed late 1982 and included a story of the opening of Mora Pellets plant

and also a story of the many briquetting plants in White Russia

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## 37 Briquetts plants in Bela Russia 1982



Bela Russia or White Russia is a country with lots of Mires. And from peat you can also produce pellets or briquetts with good result.

1982 there where 37 large units with sophisticated dryers with steam, pneumatic or with exhaust gases.

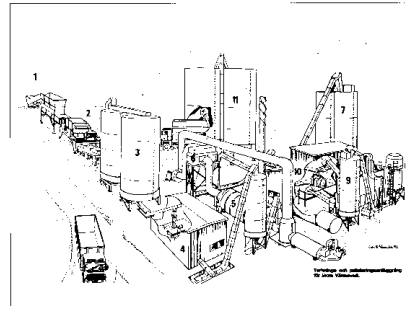
One of the largest plants was Starobinsky with a yearly production of 240 000 tons.

Similar plants existed also in Ireland. In 1987 a new plant was built in the north of Sweden, in Sveg, for the purpose of heating the city of Uppsala 500 km south. Today they use a mixture of wood and peat and the do also produce wood/peat pellets.

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# The new pellet plant in Mora (1982)



This was a state of the art unit and one of the kind but it got into problem.

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# A lot ´s of firsts in Mora

## Jag är alternativet till den allt dyrare oljan!



Oljepriset stiger stadigt allt högre och högre. Man frågar sig oroligt — var skall det sluta. För mig — jag som är en inhemsk energikälla och kallas Mora Pellets är det ganska angenämt. Jag blir bara billigare och billigare ju mer oljan stiger i pris. Jag står helt utanför oljekriser, blockader och dollarns stigande kurser som drar med sig oljepriset i höjden.

Näringslivet i Mora är starkt och ofta utvecklingsrikt. Det är energiområdet som växer mest i riket. Pellets växer stadigt i olika delar av landet och utvecklingen är snabb. Utbyggnaden av Mora Pellets AB i Mora ska stå klar 2002 för att tillåta 100 000 ton pellets per år.

|                            |   |                            |
|----------------------------|---|----------------------------|
| 1500 kr<br>olja<br>per ton | 1822 kr<br>pellets<br>till svenska<br>kylskåp | 2470 kr<br>olja<br>per ton |
|----------------------------|---|----------------------------|

Konsumtion: Innehåller 1000 liter olja och 1000 liter pellets. Innehåller 1000 liter olja och 1000 liter pellets. Innehåller 1000 liter olja och 1000 liter pellets. Innehåller 1000 liter olja och 1000 liter pellets.

Allt talar ju också för att det kommer att bli ännu förmånligare att utnyttja inhemsk energi. Det finns förslag på styrsatser som kommer att drabba både el- och oljeförbrukare.

Nu gäller det verkligen att studera vilket uppvärmningssystem du skall ha och planera för framtiden.

Distributionen av Mora Pellets kommer att ske på samma sätt som med olja, i tankbilar, enkelt, rent och praktiskt.



Tag kontakt med Mora Värmeverk AB — för visst är du intresserad att sänka dina värmekostnader. Ring 0250-260 00 ansk. 367 eller 338.

**Mora Pellets**

In Sweden during this time we were afraid of the oil supply so the government supported new energy resources.

But at the same time the traditional forestry industry was protected with a lot of laws.

E.g. Only rejected wood, like bark or rotted wood was allowed to be used and everything had to be controlled by the industry, the government and the labour union.

In 1986 almost all pellets use in Sweden stopped because of lot ´s of state supported electricity from new nuclear plants!

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One producer survived



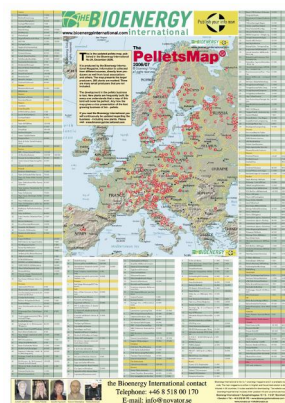
In Ulricehamn in the south of Sweden one plant focused in production of wood powder and had a long time contract with a large heating plant in Göteborg.

This plant, now owned by Lantmännen, is modernized and expanded and produces now wood powder, pellets, electricity and district heating for the nearby city of Ulricehamn.

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So let us now jump to 2006/07



The progress is rapid. After last 2005/06 shortage, a lot of investment capital was brought into the business.

In our map, Dec 2006, we marked 285 plants, most larger than 10 000 tons a year. Average around 20 000 tons.

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## Also small scale producers

- But the listed 285 plants was of course not all.
- There are also many small plants.
- Only the ones delivered in last 4 years by Swedish supplier SPC are more than 80 units. And there are several other suppliers as well in the small scale market.
- Note that the small scale producers uses dry feedstock.

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## But lot´s of uncertainty

- Nobody knows how much pellets actually is produced. There is no official statistics available. The producers as well as the consumers are sometimes also reluctant to inform.
- There is also a question of capacity (possibility to produce) and the actual production.

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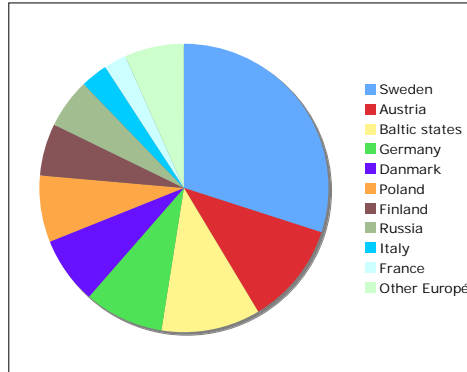
## European Pellets production

The total large scale production 2006 was around 5 000 000 tons of pellets.

Sweden is dominating with a share of 30 percent. Next year Russia may be No 2.

We estimate production 2007 to increase with 25-30 percent and reach 6 500 000. Market will however rule. There may be capacity for as much as 7 500 000 tons in Europe.

Then comes import potential it may reach 3 000 000 tons 2007 and later increase significantly.

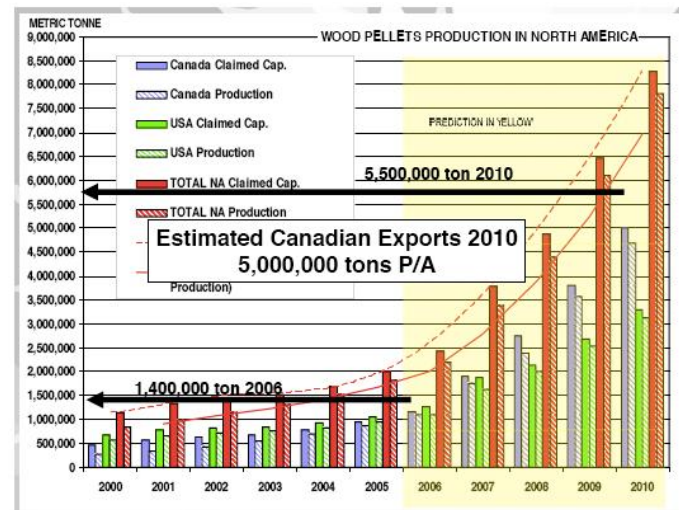


2006 market value:  
close to 1 000 000 000 Euro

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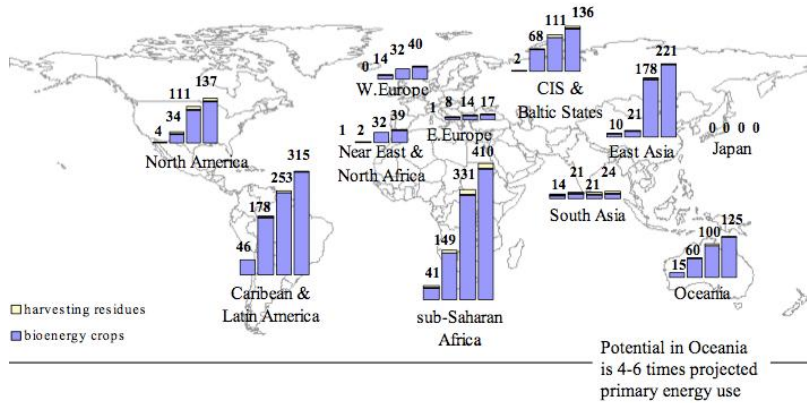
## Canada Export Tomorrow



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Bio-energy production potential in 2050 for different scenarios



Source: E. Smeets, A. Faaij, I. Lewandowski – March 2004  
 A quickscan of global bio-energy potentials to 2050: analysis of the regional availability of biomass resources for export in relation to underlying factors, Copernicus Institute - Utrecht University, NWS-E-2004-109.

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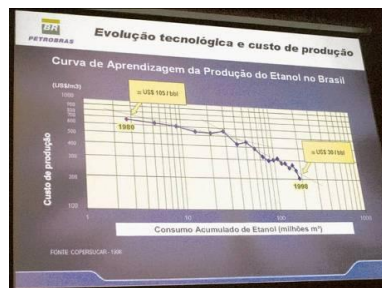


Learning curve

When we talk about development. Never forget the learning curve.

This example is from the ethanol business.

Integrated and larger pellets plants with energy recovery etc. and more flexible raw material use will make this possible also for pellets.



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# Bioenergy standards

- For many years biomass standards has been developed in Europe.
- One by one they are accepted and brought into full force.
- It is most important to follow the standards.
- A work for ISO standards based on CEN/TS standards will be initiated.

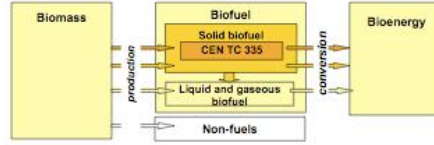
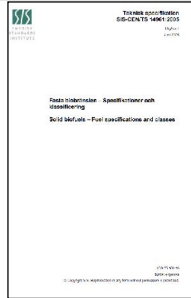


Figure 1 — CEN TC 335 within the biomass – biofuel – bioenergy field



**Table 2 — Major traded forms of solid biofuels**

| Fuel name            | Typical particle size | Common preparation method                                     |
|----------------------|-----------------------|---|
| Brquette             | Ø = 25 mm             | Mechanical compression  |
| Pellets              | Ø = 6 mm              | Milling   |
| Fuel powder          | < 1 mm                | Milling   |
| Granule              | 6 mm to 8 mm          | Cutting with sharp tools                                      |
| Wood chips           | 5 mm to 100 mm        | Cutting with sharp tools                                      |
| Hog fuel             | Varying               | Cutting with blunt tools                                      |
| Log                  | 100 mm to 1000 mm     | Cutting with sharp tools                                      |
| Whole wood           | > 400 mm              | Cutting with sharp tools                                      |
| Small straw bales    | 0.1 m <sup>3</sup>    | Compressed and bound to squares                               |
| Big straw bales      | 3.7 m <sup>3</sup>    | Compressed and bound to squares                               |
| Round straw bales    | 2.1 m <sup>3</sup>    | Compressed and bound to cylinders                             |
| Bundle               | Varying               | Lengthwise oriented & bound                                   |
| Straw                | Varying               | Detaching residue from trees<br>Can be shredded or unshredded |
| Chopped straw        | 10 mm to 200 mm       | Chopped during harvesting                                     |
| Grass or reed        | Varying               | No preparation or drying                                      |
| Straw and flax stems | 5 mm to 15 mm         | No preparation  |
| Fibre cake           | Varying               | Prepared from fibrous waste by dewatering                     |

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| CEN/TS 14961:2005 (E)  |  | CEN/TS 14961:2005 (E) |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
|--|--|-----------------------|---|---|--|----------------------------|---------|-----------------|--|--|--|------|--------------------------------------|------|---------------------------------------|------|--|------|--|------|--|----------------------------|--|-----|--------|-----|--------|-----|--------|------------------------|--|------|---------|------|---------|------|---------|------|---------|------|-------------------------------------|----------------------------|--|-------|----------|-------|----------|-------|----------|--------|--------------------------------------|--|--|--------|----------|--------|----------|--------|----------|---|--|------|---------|------|-------------------------------------|---|--|----------------------------------|--|---|--|---------------------------------|--|------|---------|------|---------|------|---------|------|---------|-------|-------------------------------------|---|---------------------------------------|-------------------------------------|---|---|--|--|--|
| <p><b>Table 5 — Specification of properties for pellets</b></p> <table border="1"> <tr> <td>Master table</td> <td>Woody biomass (1),<br/>Herbaceous biomass (2),<br/>Fruit biomass (3),<br/>Stems and molasses (4)</td> </tr> <tr> <td>Origin:<br/>According to 6.1 and Table 1</td> <td></td> </tr> <tr> <td>Treated Form (see Table 2)</td> <td>Pellets</td> </tr> <tr> <td>Dimensions (mm)</td> <td></td> </tr> <tr> <td>Diameter (D) and Length (L)<sup>1</sup></td> <td></td> </tr> <tr> <td>D200</td> <td>≤ 8 mm ± 0.3 mm and L ≤ 5 × Diameter</td> </tr> <tr> <td>D200</td> <td>≤ 8 mm ± 0.3 mm, and L ≤ 4 × Diameter</td> </tr> <tr> <td>D210</td> <td>≤ 10 mm ± 0.5 mm, and L ≤ 4 × Diameter</td> </tr> <tr> <td>D212</td> <td>≤ 12 mm ± 1.0 mm, and L ≤ 4 × Diameter</td> </tr> <tr> <td>D225</td> <td>≤ 25 mm ± 1.0 mm, and L ≤ 4 × Diameter</td> </tr> <tr> <td>Mixture (w-%, as received)</td> <td></td> </tr> <tr> <td>M10</td> <td>≤ 10 %</td> </tr> <tr> <td>M15</td> <td>≤ 15 %</td> </tr> <tr> <td>M30</td> <td>≤ 30 %</td> </tr> <tr> <td>Ash (w-% of dry basis)</td> <td></td> </tr> <tr> <td>A0.7</td> <td>≤ 0.7 %</td> </tr> <tr> <td>A1.5</td> <td>≤ 1.5 %</td> </tr> <tr> <td>A3.0</td> <td>≤ 3.0 %</td> </tr> <tr> <td>A6.0</td> <td>≤ 6.0 %</td> </tr> <tr> <td>A8.0</td> <td>&gt; 8.0 % (actual value to be stated)</td> </tr> <tr> <td>Sulphur (w-% of dry basis)</td> <td></td> </tr> <tr> <td>S0.05</td> <td>≤ 0.05 %</td> </tr> <tr> <td>S0.08</td> <td>≤ 0.08 %</td> </tr> <tr> <td>S0.10</td> <td>≤ 0.10 %</td> </tr> <tr> <td>S0.20+</td> <td>&gt; 0.20 % (actual value to be stated)</td> </tr> <tr> <td>Mechanical durability (w-% of pellets after testing)</td> <td></td> </tr> <tr> <td>MDR1.5</td> <td>≥ 97.5 %</td> </tr> <tr> <td>MDR3.0</td> <td>≥ 98.0 %</td> </tr> <tr> <td>MDR6.0</td> <td>≥ 99.0 %</td> </tr> <tr> <td>Amount of fines (w-%, &lt; 3.15 mm) after production at factory gate</td> <td></td> </tr> <tr> <td>F1.0</td> <td>≤ 1.0 %</td> </tr> <tr> <td>F2.0</td> <td>&gt; 2.0 % (actual value to be stated)</td> </tr> <tr> <td>At the last possible place in the production site</td> <td></td> </tr> <tr> <td>Additives (w-% of pressing mass)</td> <td></td> </tr> <tr> <td>Type and content of pressing aids, slopping inhibitors or any other additives have to be stated</td> <td></td> </tr> <tr> <td>Nitrogen (N) (w-% of dry basis)</td> <td></td> </tr> <tr> <td>N0.3</td> <td>≤ 0.3 %</td> </tr> <tr> <td>N0.5</td> <td>≤ 0.5 %</td> </tr> <tr> <td>N1.0</td> <td>≤ 1.0 %</td> </tr> <tr> <td>N3.0</td> <td>≤ 3.0 %</td> </tr> <tr> <td>N6.0+</td> <td>&gt; 3.0 % (actual value to be stated)</td> </tr> <tr> <td>Heat capacity value, w<sub>100</sub> (MJ/kg, as received) or<br/>Energy density (E<sub>100</sub>) (MJ/m<sup>3</sup>, loose)</td> <td>Recommended to be informed by recast.</td> </tr> <tr> <td>Moisture content (w-%, as received)</td> <td>Recommended to be stated if traded by volume basis.</td> </tr> <tr> <td>Chlorine, Cl (weight of dry basis, w-%)</td> <td>Recommended to be stated as a category.<br/>Cl C03, Cl 0.07, Cl 0.10 and Cl 0.10+ (Cl &gt; 0.10 % the actual value to be stated)</td> </tr> </table> |  | Master table          | Woody biomass (1),<br>Herbaceous biomass (2),<br>Fruit biomass (3),<br>Stems and molasses (4) | Origin:<br>According to 6.1 and Table 1 |  | Treated Form (see Table 2) | Pellets | Dimensions (mm) |  | Diameter (D) and Length (L) <sup>1</sup> |  | D200 | ≤ 8 mm ± 0.3 mm and L ≤ 5 × Diameter | D200 | ≤ 8 mm ± 0.3 mm, and L ≤ 4 × Diameter | D210 | ≤ 10 mm ± 0.5 mm, and L ≤ 4 × Diameter | D212 | ≤ 12 mm ± 1.0 mm, and L ≤ 4 × Diameter | D225 | ≤ 25 mm ± 1.0 mm, and L ≤ 4 × Diameter | Mixture (w-%, as received) |  | M10 | ≤ 10 % | M15 | ≤ 15 % | M30 | ≤ 30 % | Ash (w-% of dry basis) |  | A0.7 | ≤ 0.7 % | A1.5 | ≤ 1.5 % | A3.0 | ≤ 3.0 % | A6.0 | ≤ 6.0 % | A8.0 | > 8.0 % (actual value to be stated) | Sulphur (w-% of dry basis) |  | S0.05 | ≤ 0.05 % | S0.08 | ≤ 0.08 % | S0.10 | ≤ 0.10 % | S0.20+ | > 0.20 % (actual value to be stated) | Mechanical durability (w-% of pellets after testing) |  | MDR1.5 | ≥ 97.5 % | MDR3.0 | ≥ 98.0 % | MDR6.0 | ≥ 99.0 % | Amount of fines (w-%, < 3.15 mm) after production at factory gate |  | F1.0 | ≤ 1.0 % | F2.0 | > 2.0 % (actual value to be stated) | At the last possible place in the production site |  | Additives (w-% of pressing mass) |  | Type and content of pressing aids, slopping inhibitors or any other additives have to be stated |  | Nitrogen (N) (w-% of dry basis) |  | N0.3 | ≤ 0.3 % | N0.5 | ≤ 0.5 % | N1.0 | ≤ 1.0 % | N3.0 | ≤ 3.0 % | N6.0+ | > 3.0 % (actual value to be stated) | Heat capacity value, w <sub>100</sub> (MJ/kg, as received) or<br>Energy density (E <sub>100</sub> ) (MJ/m <sup>3</sup> , loose) | Recommended to be informed by recast. | Moisture content (w-%, as received) | Recommended to be stated if traded by volume basis. | Chlorine, Cl (weight of dry basis, w-%) | Recommended to be stated as a category.<br>Cl C03, Cl 0.07, Cl 0.10 and Cl 0.10+ (Cl > 0.10 % the actual value to be stated) | <p><b>Annex A<br/>(informative)</b></p> <p><b>Examples of specifications for high quality classes of solid biofuels recommended for household usage</b></p> <p>The following examples are specifications for high quality classes of solid biofuels recommended for household usage. Household usage needs special considerations for the following reasons:</p> <ul style="list-style-type: none"> <li>— Small-scale equipment does not usually have advanced control and gas cleaning</li> <li>— Unprofessional management</li> <li>— Often located in living and populated districts</li> </ul> <p><b>A.1 Wood briquettes</b> (selected from Table 4)</p> <p>Origin: 1.2.1.1 Chemically untreated wood without bark</p> <p>Moisture content: M10</p> <p>Basic density: DE1.0</p> <p>Dimensions: to be selected from Table 4.</p> <p>Ash content: A0.7</p> <p>Additives: &lt; 2 w-% of dry basis. Only products from the primarily agricultural and forest biomass that are not chemically modified are approved to be added as a pressing aids. Type and amount of additive has to be stated.</p> <p>Energy density: E4.7 [MJ/kg] (E<sub>100</sub>) ≥ 4.7 MJ/kg = 16.0 MJ/kg</p> <p><b>A.2 Wood pellets</b> (selected from Table 5)</p> <p>Origin: 1.2.1.1 Chemically untreated wood without bark</p> <p>Moisture content: M10</p> <p>Mechanical durability: D097.5</p> <p>Amount of fines: F1.0 or F2.0</p> <p>Dimensions: D06 or D08</p> <p>Ash content: A0.7</p> <p>Sulphur content: S0.05</p> <p>Additives: &lt; 2 w-% of dry basis. Only products from the primarily agricultural and forest biomass that are not chemically modified are approved to be added as a pressing aids. Type and amount of additive has to be stated.</p> <p>Energy density: E4.7 [MJ/kg] (E<sub>100</sub>) ≥ 4.7 MJ/kg = 16.0 MJ/kg</p> <p><b>A.3 Wood chips</b> (selected from Table 7)</p> <p>Origin: 1.1.2 Straw wood</p> <p>Moisture content: M20 or M30</p> <p>Dimensions: P16, P45 or P63</p> <p>Energy density: E0.9 [MJ/loose m<sup>3</sup>] (E<sub>100</sub>) ≥ 900 kWh/loose m<sup>3</sup></p> |  |
| Master table   | Woody biomass (1),<br>Herbaceous biomass (2),<br>Fruit biomass (3),<br>Stems and molasses (4)                                |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Origin:<br>According to 6.1 and Table 1  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Treated Form (see Table 2)   | Pellets  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Dimensions (mm)  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Diameter (D) and Length (L) <sup>1</sup>   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| D200   | ≤ 8 mm ± 0.3 mm and L ≤ 5 × Diameter   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| D200   | ≤ 8 mm ± 0.3 mm, and L ≤ 4 × Diameter  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| D210   | ≤ 10 mm ± 0.5 mm, and L ≤ 4 × Diameter   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| D212   | ≤ 12 mm ± 1.0 mm, and L ≤ 4 × Diameter   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| D225   | ≤ 25 mm ± 1.0 mm, and L ≤ 4 × Diameter   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Mixture (w-%, as received)   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| M10  | ≤ 10 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| M15  | ≤ 15 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| M30  | ≤ 30 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Ash (w-% of dry basis)   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| A0.7   | ≤ 0.7 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| A1.5   | ≤ 1.5 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| A3.0   | ≤ 3.0 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| A6.0   | ≤ 6.0 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| A8.0   | > 8.0 % (actual value to be stated)  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Sulphur (w-% of dry basis)   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| S0.05  | ≤ 0.05 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| S0.08  | ≤ 0.08 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| S0.10  | ≤ 0.10 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| S0.20+   | > 0.20 % (actual value to be stated)   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Mechanical durability (w-% of pellets after testing)   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| MDR1.5   | ≥ 97.5 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| MDR3.0   | ≥ 98.0 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| MDR6.0   | ≥ 99.0 %   |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Amount of fines (w-%, < 3.15 mm) after production at factory gate  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| F1.0   | ≤ 1.0 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| F2.0   | > 2.0 % (actual value to be stated)  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| At the last possible place in the production site  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Additives (w-% of pressing mass)   |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Type and content of pressing aids, slopping inhibitors or any other additives have to be stated  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Nitrogen (N) (w-% of dry basis)  |  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| N0.3   | ≤ 0.3 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| N0.5   | ≤ 0.5 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| N1.0   | ≤ 1.0 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| N3.0   | ≤ 3.0 %  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| N6.0+  | > 3.0 % (actual value to be stated)  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Heat capacity value, w <sub>100</sub> (MJ/kg, as received) or<br>Energy density (E <sub>100</sub> ) (MJ/m <sup>3</sup> , loose)  | Recommended to be informed by recast.  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Moisture content (w-%, as received)  | Recommended to be stated if traded by volume basis.  |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |
| Chlorine, Cl (weight of dry basis, w-%)  | Recommended to be stated as a category.<br>Cl C03, Cl 0.07, Cl 0.10 and Cl 0.10+ (Cl > 0.10 % the actual value to be stated) |                       |   |   |  |                            |         |                 |  |  |  |      |                                      |      |                                       |      |  |      |  |      |  |                            |  |     |        |     |        |     |        |                        |  |      |         |      |         |      |         |      |         |      |                                     |                            |  |       |          |       |          |       |          |        |                                      |  |  |        |          |        |          |        |          |   |  |      |         |      |                                     |   |  |                                  |  |   |  |                                 |  |      |         |      |         |      |         |      |         |       |                                     |   |                                       |                                     |   |   |  |  |  |

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## Finally remember the market

- What is true today may not be true tomorrow.
- Winter 05/06 lack of pellets
- Winter 05/06 prices went sky high
- Winter 06/07 market reacted and so did the weather warmest winter in long time
- Winter 06/07 lot of pellets
- What will happen 07/08??

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## Thanks

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