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Executive Order on the use of bioash for farming and forestry purposes (the Executive Order on Bioash)[1)]

Pursuant to section 7(1), item 8, section 7 a(1), section 16(1) and (2), section 19(5) and (7), section 44(1), section 73, section 92 and section 110(3) and (4) of the Danish Environmental Protection Act (*Lov om miljøbeskyttelse*), Consolidation Act no. 1757 of 22 December 2006, the following is stipulated:

Part 1

Scope etc. of the executive order

1. This executive order lays down rules specifying to which extent bioash may be used for farming and forestry purposes without disregarding environmental protection.

2.-(1) Bioash may be used as a substitute for a standard fertiliser product or soil improver for farming and forestry purposes in accordance with the provisions of this executive order.

(2) The executive order does not apply to bioash from a single or a few households combusting their own biomass, see Appendix 1, when the ash is recycled to the ash producer's own land from which the biomass and biomass waste originate.

(3) When mixing bioash from several ash producers, each bioash must be sampled prior to mixing with a view to analysing for compliance with the limit values in Appendix 2.

(4) The executive order also does not apply when bioash is mixed with other types of waste for farming and forestry purposes, see the rules set out in the Ministry of Environment's Executive Order on the use of waste products for farming and forestry purposes (the Executive Order on Sludge (Slambekendtgørelsen)).

(5) When mixing up to ten per cent bioash, calculated on a dry matter basis, with animal manure, the rules set out in the Ministry of Environment's Executive Order on livestock farming and animal husbandry for more than three animal units, animal manure, silage, etc. (Bekendtgørelse om husdyrbrug og dyrehold for mere end 3 dyreenheder, husdyrgødning, ensilage mv.) apply. Prior to mixing with the animal manure, however, the bioash must comply with the limit values in Appendix 2.

Part 2

Definitions

3. In this executive order, the following definitions apply:

1) Bioash: Ash from the gasification and combustion of the types of biomass, biomass waste and consumables included in Appendix 1. Bioash also refers to aqueous extracts thereof.
2) Ash producer: The producer, processor, mixer or seller of bioash to be sold for farming and forestry purposes.
3) User: The holder of the right of use to the land on which bioash is applied.
4) Farming and forestry: Plant, tree or timber production in farming, forestry and horticulture as well as garden, park or cemetery management and the like.
5) Farming and forestry purposes: Fertilisation or soil improvement in farming and forestry.
6) Wood ash: Ash from the combustion of wood with addition of up to 25 per cent (biomass dry matter) straw.

7) Straw ash: Ash from the combustion of straw with addition of up to 25 per cent (biomass dry matter) wood.

8) Bottom ash: The ash which is removed from the bottom of a plant for gasification or combustion of biomass and biomass waste and not mixed with fly ash or other ash fractions.

9) Fly ash: The ash which is removed from flue gas cleaning from a plant for gasification or combustion of biomass or biomass waste with the exception of condensed sludge.

10) Aqueous extract of bioash: Aqueous solution of potassium chloride, potassium sulphate and other salts extracted from bioash.

11) Pre-treated ash: Ash for which the reactivity has been actively reduced due to chemical carbonation or physical stabilisation.

12) Mixed ash: Mixture of fly and bottom ash produced simultaneously at the same plant.

13) Mixed straw and wood ash: Ash obtained from the combustion of straw and wood at the same plant and not covered by items 6) and 7).

14) Brought down: a method of bringing the ash into the soil such as plough down, stirring into the soil or direct injection.

15) Planning period: The period from 1 August to 31 July.

Part 3
Requirements for the producer

4. An ash producer selling bioash to a user is responsible for complying with the requirements of this part.

Control and product requirements

5.-(1) Bioash must only be used for farming and forestry purposes if the limit values in Appendix 2 have been complied with.

(2) Bioash which is spread in a forest must, in addition to complying with the limit values in Appendix 2, comply with the criteria in Appendix 2 D.

6.-(1) The ash producer must ensure that bioash samples analysed are representative. Analysis frequency, parameters and methods appear from Appendix 3. The municipal council in the municipality in which the bioash was produced may, upon application from the producer, decide that certain analysis parameters can be excluded from the analysis. The analysis reports must be stored by the ash producer along with a copy of the declaration or the standard declaration, see section 7.

(2) The ash producer may collect representative ash samples himself or entrust this task to a laboratory experienced in sampling.

(3) If there is reason to suspect that the ash sampling is not representative, or if the analysis results are very varying or atypical for the ash type in question, the municipal council may demand that an accredited laboratory perform the sampling. Until new analysis results are available, the municipal council may ban the use of bioash, see section 18(3).

Declarations

7.-(1) The ash producer must prepare a declaration for the bioash. Appendix 4 of this executive order, 'Form for the declaration of bioash', must be used when preparing the declaration.

(2) The standard declaration for straw bottom ash, see Appendix 5 to this executive order, may be used as a declaration if the ash producer documents that the bottom ash under a given fuel and under given operating parameters complies with the limit values in Appendix 2 and that the cadmium content does not exceed 0.5 mg Cd/kg dry matter.

(3) The ash producer must prepare a declaration as stated in subsection (1), see Appendix 4, if the information forming the basis for the standard declaration is changed or if new analysis results for the bioash exceed the value for cadmium specified in subsection (2).

Sale

8.-(1) An ash producer entering into an agreement with a user on delivery of bioash is responsible for declaring the ash in accordance with section 7 and for ensuring that the declaration or standard declaration accompanies the ash.

(2) Delivery of bioash may only take place upon written agreement between the ash producer and the user. The delivery agreement must contain the user's name and address, the delivery date as well as information on the quantity of bioash delivered in weight units. For the purpose of the municipality's supervision, the agreement must specify whether the quantity of bioash delivered corresponds to the quantity of biomass delivered and whether the bioash will be recycled to the farm or forestry from which the biomass originates.

(3) The agreement may only cover deliveries which the user is able to use himself, in the current or the next planning period, in accordance with the rules set out in this executive order.

9. No later than eight days prior to the first delivery to the user, the ash producer must submit a copy of the declaration or standard declaration, see section 7, and the delivery agreement, see section 8(2), to the municipal council in the municipality in which the bioash will be used. If the declaration or standard declaration is changed, the ash producer must submit a new copy to the municipal council no later than eight days after the change.

Reporting to the Danish Environmental Protection Agency (EPA)

10. Every year before 1 April, the ash producer must report electronically to the Danish EPA the quantities in weight units of bioash sold for use for farming and forestry purposes in the preceding calendar year, broken down by use on land for farming, forestry, horticulture and park management.

Part 4
Requirements for the user

11. A user receiving bioash for farming and forestry purposes is responsible for ensuring that the requirements of this part are complied with.

Storage

12.-(1) An application for authorisation, see section 19(1) of the Danish Environmental Protection Act, to store bioash is not required if the user has a covered storage facility which complies with the rules on storage and storage capacity set out in the Ministry of Environment's Executive Order on livestock farming and animal husbandry for more than three animal units, animal manure, silage, etc.

(2) Application is also not required if the bioash is stored in an environmentally acceptable manner such as in a closed container or in big bags, so that, in case of sudden thaw or heavy rain, there is no risk of run-off into lakes, watercourses or drains, or of contamination of groundwater, or of the ash being spread in an uncontrolled manner or of any other substantial nuisances.

(3) The user is allowed to keep in storage no more than the amount of bioash which he is able to use himself within the current or the next planning period.

(4) Bioash may, without permission in accordance with section 19(1) of the Danish Environmental Protection Act, be stored for a maximum of 14 days in the spreading area in connection with spreading.

Storage capacity

13.-(1) Facilities used for storage of bioash and mixed bioash with animal manure must have a capacity which is in accordance with the rules on storage set out in the Ministry of Environment's Executive Order on livestock farming and animal husbandry for more than three animal units, animal manure, silage, etc.

(2) In case a user does not have the capacity to store bioash for his own consumption, the user may enter into a written agreement on storage with a user of a neighbouring property. The storage facility must meet the storage requirements of section 12(1) or (2). The amount of bioash stored at the neighbouring property must not exceed the amount which the user is able to use himself within the current or the next planning period. When an agreement on storage of bioash at a neighbouring property has been made, the user must notify the municipal council thereof. The user must upon request submit a copy of the agreement to the municipal council.

Use of bioash for farming and forestry purposes

14.-(1) When using bioash in farming, the total supply of cadmium may not exceed 0.8 g Cd per hectare per year. The cadmium dosage may be calculated as an average over five years. A maximum of 5 tonnes of dry matter may be added per hectare per five years on farmland.

(2) When using bioash for forestry, the total supply of cadmium may not exceed 60 g Cd per hectare per 75 years. A maximum of 3 tonnes of dry matter per hectare per 10 years may be spread in a forest; however, not exceeding 3 spreads of 3 tonnes per 75 years. Dosing of ash for spreading in a forest must also comply with the provisions of Appendix 2 D.

(3) The total supply of nutrients in the form of phosphorus may not exceed 30 kg per hectare per year. The phosphorus dosage may be calculated as an average over three years.

15.-(1) When bioash is supplied to areas and not brought down immediately after spreading, only cereal or seed crops, and crops which are not consumed raw by animals or humans, may be cultured to maturity until six months after spreading.

(2) In connection with spreading in a forest, signs should be posted around the area for at least three months after spreading, indicating that picking berries, gathering fungi and the like is not recommended, unless the bioash is brought down or pre-treated so that no dust is formed during spreading. The bioash must be distributed evenly over the entire area.

(3) In connection with direct spreading of aqueous extract, the pH of the extract should be between 6 and 8.

Duty of notification

16.-(1) If a user receives bioash consisting of mixed straw and wood ash, or a larger amount of bioash than what corresponds to the delivered biomass measured in ash percentage, the user must notify the municipal council in writing of the amount no later than 31 July in the planning period in which the user uses or intends to use the bioash.

(2) When using bioash on a farm, the user must enclose a field plan with indication of the spreading areas. When using bioash in forestry, the user must enclose a forest plan with indication of the spreading areas.

(3) The ash percentage for straw and wood is set at 5 per cent and 1 per cent, respectively. If the ash producer can document a production-based ash percentage, that may be used instead.

(4) The duty of notification only applies when the user receives a total of more than 5 tonnes of dry matter per planning period.

Part 5 *Requirements for soil quality*

17. Areas supplied with bioash may not contain higher amounts of heavy metals than indicated in Appendix 6.

Part 6

Supervision and enforcement

18.-(1) The municipal council may order a user to sample and analyse soil in order to document that the requirements for soil quality of section 17 have been met, if there is reason to suspect that these requirements have been violated or if there is a risk of violation. Sampling and analysis must be performed in accordance with the provisions of Appendix 6 by an appropriately accredited laboratory. The expenses for these samples are paid by the user.

(2) The municipal council may order the user to initiate corrective actions in case the use or storage of bioash gives or may give rise to pollution or substantial nuisances.

(3) The municipal council may ban the use of bioash, provided that the use causes pollution or the risk thereof.

Part 7

Complaint

19. The municipal council's decisions made under this executive order may not be appealed to any other administrative authority.

Part 8

Penalty

20.-(1) Unless a higher penalty is prescribed under other legislation, a fine will be imposed on anyone who:

1) uses bioash without complying with the limit values set out in Appendix 2 and Appendix 2 D, see section 5,
2) fails to ensure that analysis, as prescribed in section 6, has been performed,
3) fails to prepare a declaration, see section 7,
4) fails to ensure that bioash is sold in accordance with section 8,
5) fails to enter into an agreement as prescribed in section 8,
6) fails to submit a declaration to the municipal council, see section 9, or
7) fails to report to the Danish EPA, see section 10,
8) fails to provide the required storage capacity, see section 13,
9) uses bioash for farming and forestry purposes in violation of section 14,
10) uses bioash in violation of section 15,
11) fails to submit information, see section 16,
12) supplies bioash to areas which contain higher amounts of heavy metals than indicated in section 17, see Appendix 6, or
13) fails to comply with orders or bans in accordance with section 18.

(2) The penalty may be increased to a prison sentence of up to two years if the infringement is committed intentionally or through gross negligence and if the infringement has:

1) caused damage to the environment or resulted in the risk thereof, or
2) achieved, or was intended to achieve, financial gain for the person concerned or for others, including as a result of savings made.

(3) Criminal liability may be imposed on companies etc. (legal persons) under the rules of Part 5 of the Danish Criminal Code (Straffeloven).

Part 9

Entry into force

21.-(1) This executive order enters into force as of 15 August 2008.

(2) Executive Order no. 1636 of 13 December 2006 on the use of ash from gasification and combustion of biomass and biomass waste for farming and forestry purposes (Bekendtgørelse nr. 1636 af 13. december 2006 om anvendelse af aske fra forgasning og forbrænding af biomasse og biomasseaffald til jordbrugsformål) is repealed.

Ministry of Environment, 21 July 2008

TROELS LUND POULSEN

/ Claus Torp

[1)] Notification of the contents of this executive order has been made in accordance with Directive 98/34/EC of the European Parliament and of the Council (the Technical Standards Directive), as amended by Directive 98/48/EC, as a draft version of a previous executive order (Executive Order no. 39 of 20 January 2000).

Appendix 1

List of biomass and biomass waste types covered by the definition of bioash according to section 3, item 1, of this executive order

A) Raw wood, including bark, whole-tree chips, untreated sawmill wood chips and wood chips from energy wood plantations.
B) Pure wood (including wood pellets, wood chips and sawdust) without adhesive, lacquer, impregnation, paint (in addition to any sawmill stamps and the like), foil, laminate, nails, screws, attachments, etc.
C) Wood waste and wood pellets from the production and processing of pure, laminated wood with a content of adhesive (phenol-resorcinol adhesive, polyvinyl acetate adhesive, urea-formaldehyde adhesive, polyurethane adhesive and melamine-urea-formaldehyde adhesive) not exceeding 1% by weight of the dry matter.
D) Straw (including binding strings from straw bales) and related straw crops from annual or perennial energy crops (miscanthus, oilseed rape, energy cereals and the like).
E) Vegetable waste obtained after the extraction of bioethanol from the biomass waste of A) to D).

List of consumables covered by the definition of bioash according to section 3, item 1, of this executive order

In the combustion process to prevent formation of slag, corrosion, etc.:

- Lime
- Chalk
- Cement
- Sand and gravel
- Clay and clay minerals.

Addition of consumables may not exceed 10%, calculated on a dry matter basis.

Processing of ash to ash pellets:

- Seed husk
- Lime
- Lignin
- Cement
- Sand and gravel
- Clay and clay minerals.

The processed ash may contain a maximum of 10% of consumables, calculated on a dry matter basis.

Appendix 2

Limit values for bioash and aqueous extracts, see section 5(1) and (2)

A. *Limit values for heavy metals*

Table 1. Limit values for heavy metals

Heavy metal	**Limit value (mg per kg dry matter)**
Mercury	0.8
Lead	120 250 wood ash used in forestry
Nickel	60
Chromium	100
Cadmium	5 straw ash 20 wood ash 5 mixed straw and wood ash

B. *Check for compliance with limit values for heavy metals*

The analysis values must comply with the dry matter-related limit values in Table 1, section A. The analysis results for at least four of the most recent five samples must be below the limit values. However, no sample may exceed a limit value by more than 50 per cent.

C. *Limit value for polyaromatic hydrocarbons, ΣPAH*

In case the flue gas has been monitored continuously for CO and the CO value does not exceed 625 mg/m^3 (10% O_2) for straw ash and 313 mg/m^3 (10% O_2) for wood ash, the requirement for PAH analysis does not apply.

In case CO is not monitored, the ash must be analysed for PAH, and the limit value for PAH in Table 2 must be complied with.

Table 2. Limit value for PAH

ΣPAH	**Limit value (mg per kg dry matter)**
ΣAcenaphthene, phenanthrene, fluorene, fluoranthene, pyrene, benz(b+j+k)fluoranthene, benzo(a)pyrene, benz(ghi)perylene, indeno(1,2,3-cd)pyrene	12

D. *Reactivity and maximum dosage of wood ash when spreading the ash in a forest*

Below 2,800 mS/m: max. 3 tonnes of dry matter/hectare/10 years

2,800-3,200 mS/m: max. 2 tonnes of dry matter/hectare/10 years

3,200-3,600 mS/m: max. 1 tonne of dry matter/hectare/10 years

Appendix 3

Sampling, analysis frequency, analysis parameters and analysis methods, see section 6

A. *Sampling*

Sampling must be performed using methods in accordance with method sheet no. 1 (*metodeblad nr. 1*) from the Danish EPA.

B. *Analysis parameters*

The samples must be analysed for the following parameters:

Cadmium

Mercury

Lead

Nickel

Chromium

Dry matter

Total phosphorus

Potassium

pH (applies to aqueous extracts)

Conductivity (applies to spreading in a forest)

PAH, see Appendix 2 C.

The municipal council may, see section 6(1), decide that the parameters mercury, lead, nickel and chromium may be omitted from analysis if the ash producer is able to document that these parameters were all at least 50% below their limit values for the most recent five samples, see Appendix 2, Table 1.

C. *Analysis frequency for heavy metals and PAH*

Table 3. Analysis frequency

Category	**Analysis frequency for PAH[1)]**	**Analysis frequency for heavy metals etc.[2)]**
Bottom ash	Every 24 months	Every 12 months
Straw ash	Every 24 months	Every 6 months
Wood ash	Every 24 months	Every 6 months
Mixed straw and wood ash	Every 24 months	Every 3 months

1) The requirement for analysis of PAH does not apply if the flue gas has been monitored continuously for CO and the CO value does not exceed 625 mg CO/m^3 (10% O_2) for straw ash and 313 mg CO/m^3 (10% O_2) for wood ash. In case CO is not monitored, the ash must be analysed for PAH, and the limit value for PAH in Appendix 2, Table 2, must be complied with.

2) Additionally, analysis must be performed for dry matter, total phosphorous, potassium, pH (for ash for spreading in a forest and aqueous extracts) and conductivity (for ash for spreading in a forest). If the ash producer is able to document, for the most recent five samples, that the contents of heavy metals in the ash are stable and 20% below the limit values, permission from the municipal council to reduce the analysis frequency for these heavy metals may be applied for in accordance with Table 4 below. Sampling must be done at the operating conditions used for the production of the majority of the ash within a year, i.e. for the load typically used during the coldest three to four months and provided that the combustion conditions and the fuel are unchanged.

Table 4. Reduction of the analysis frequency

Size of the plant	Analysis frequency
≤ 1 MW	Every 4 years
> 1 and ≤ 2.5 MW	Every 3 years
> 2.5 and ≤ 5 MW	Every 2 years
> 5 MW	Every year

D. *Analysis methods for heavy metals etc.*

Analysis of heavy metals etc. must be performed using methods in accordance with method sheet no. 1 from the Danish EPA.

E. *Analysis method for PAH*

Analysis of PAH must be performed using methods in accordance with method sheet no. 1 from the Danish EPA.

F. *Analysis method for the reactivity of wood ash*

Analysis of the reactivity of wood ash must be performed using methods in accordance with method sheet no. 1 from the Danish EPA.