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**COMMISSION DELEGATED DIRECTIVE (EU) .../...**

**of **XXX****

**amending, for the purposes of adapting to scientific and technical progress, Annex III to  
Directive 2011/65/EU of the European Parliament and of the Council as regards an  
exemption for hexavalent chromium as an anticorrosion agent in gas absorption heat  
pumps**

(Text with EEA relevance)

## EXPLANATORY MEMORANDUM

### 1. CONTEXT OF THE DELEGATED ACT

This Commission Delegated Directive amends, for the purpose of adapting to technical and scientific progress, Annex III to Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment ('the RoHS Directive')<sup>1</sup> as regards an exemption for hexavalent chromium as an anticorrosion agent in gas absorption heat pumps.

Article 4 of the RoHS Directive restricts the use of certain hazardous substances in electrical and electronic equipment. Currently, 10 substances (or groups of substances) are restricted and listed in Annex II to the Directive: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE), bis(2ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP).

Annexes III and IV to the Directive list the materials and components of electrical and electronic equipment for specific applications exempted from the substance restrictions in Article 4(1). Article 5 provides for Annexes III and IV to be adapted to scientific and technical progress (on granting, renewing and revoking of exemptions). Under Article 5(1)(a), exemptions are to be included in Annexes III and IV only if this does not weaken the environmental and health protection afforded by Regulation (EC) No 1907/2006 (REACH)<sup>2</sup> and if any of the following conditions is fulfilled:

- the elimination or substitution of the substance via design changes or use of materials and components that do not require any of the materials or substances listed in Annex II is scientifically or technically impracticable;
- the reliability of substitutes is not ensured;
- the total negative environmental, health and consumer safety impacts of substitution are likely to outweigh the total environmental, health and consumer safety benefits.

Decisions on exemptions, and their duration, must take into account the availability of substitutes and the socio-economic impact of substitution. Decisions on the duration of exemptions must take into account any potential impact on innovation. Life-cycle thinking on the overall impacts of the exemption must apply, where relevant.

Article 5(1) provides for the Commission to include materials and components of electrical and electronic equipment for specific applications in the lists in Annexes III and IV by means of individual delegated acts pursuant to Article 20. Article 5(3) and Annex V establish the procedure for submitting exemption applications.

### 2. CONSULTATIONS PRIOR TO THE ADOPTION OF THE ACT

The Commission receives numerous requests from economic operators to grant or renew exemptions under Article 5(3) and Annex V to the RoHS Directive<sup>3</sup>.

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<sup>1</sup> OJ L 174, 1.7.2011, p. 88.

<sup>2</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing a European Chemicals Agency (OJ L 396, 30.12.2006, p. 1).

<sup>3</sup> The list is available at: [http://ec.europa.eu/environment/waste/rohs\\_eee/adaptation\\_en.htm](http://ec.europa.eu/environment/waste/rohs_eee/adaptation_en.htm).

On 23 December 2020, the Commission received an application for a new entry in Annex III. The requested exemption concerns the use of hexavalent chromium as an anticorrosion agent in the working fluid of the carbon steel sealed circuit of **gas absorption heat pumps (GAHPs)**.

In January 2021, the Commission added the request to an ongoing evaluation to carry out the required technical and scientific assessment. The study, which included a ten-week public stakeholder consultation, finished in February 2022<sup>4</sup>. Information about the consultation was provided on the project website<sup>5</sup> and one stakeholder contribution was received.

On 18 March 2022, the Commission consulted the Member States expert group for delegated acts under the RoHS Directive. It carried out all the required procedural steps relating to exemptions from the restrictions on substances under Articles 5(3) to 5(7)<sup>6</sup>. In this context, the European Parliament and the Council were notified of all activities.

### Technical evaluation

Heat pumps can be used to heat or cool an enclosed space. They use a working fluid as a medium to transfer thermal energy from or to the outside. GAHPs are thermally heat-driven, for example by burning natural gas. Their working fluid consists of a refrigerant and an absorption medium.

The GAHPs relevant for the current exemption request are designed for heating purposes in residential and professional buildings, where they can also replace existing boilers especially in high or medium temperature sectors. These GAHPs fall under the RoHS Directive, because parts such as the pump for the working fluid are electricity driven, and because they are smaller than larger GAHPs for industrial applications, which could be exempted from RoHS as large-scale fixed installations.

The working fluid in the relevant application is an ammonia-water mixture, circulating in a sealed circuit made of steel, which requires the use of a corrosion inhibitor. As an anticorrosion agent, **hexavalent chromium in the form of sodium chromate** is added into the working fluid. During the lifetime of the GAHP, the hexavalent chromium is reduced to trivalent chromium oxide, which creates a protective layer. Trivalent chromium oxide is not restricted under the RoHS Directive.

It has been confirmed in the technical assessment that the working fluid containing hexavalent chromium in GAHPs is the state-of-the-art technology and no substitutes as anticorrosion agent are currently readily available. The technology can in principle be replaced by other heating systems.

GAHP technology is more energy-efficient than combustion technologies such as regular (condensing) boilers. Where it is appropriate to modernise certain heating systems, GAHPs help to save CO<sub>2</sub> emissions. The technical assessment study concluded that each additional installed GAHP could save 15 t more of CO<sub>2</sub> emissions over 20 years compared with competing technologies such as condensing boilers or hybrid systems<sup>7</sup>. GAHPs can be

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<sup>4</sup> Study to assess requests for renewal of 12 exemptions to Annex IV of Directive 2011/65/EU [Review of request for amendment of exemption III-9: final report](#).

<sup>5</sup> Consultation period: 18 March 2021 to 27 May 2021 (<https://rohs.biois.eu/requests3.html>).

<sup>6</sup> A list of the required administrative steps is available on the [Commission website](#). The current stage of the procedure can be viewed for each draft delegated act in the Interinstitutional Registry of Delegated Acts at <https://webgate.ec.europa.eu/regdel/#/home>.

<sup>7</sup> Example household with 25 MWh of annual heating energy. Hybrid systems consist here of a condensing boiler and an electrical heat pump.

particularly beneficial if they run with renewable energies and ‘green gases’ (like biomethane or green hydrogen) instead of natural gas.

Based on information provided by the applicant, it was estimated that, in the worst case, around 38 g of hexavalent chromium is used per GAHP and around 1 400 kg would be placed on the market per year if the exemption was provided. Hexavalent chromium causes a health risk, in particular during the manufacturing of GAHPs, and in the end of life phase. The risk from sodium chromate in GAHPs was evaluated, especially under the REACH authorisation process concerning a particular application for authorisation. The concentration of hexavalent chromium is gradually reduced during the lifetime of the GAHP due to the chemical reaction to a protective layer. Assuming that the refrigerant solution is professionally removed at the end of life of the GAHP, similar to the treatment of absorption refrigerators according to the requirements of the Directive on waste electrical and electronic equipment<sup>8</sup>, the waste GAHP is to be treated in an environmentally sound manner.

Sodium chromate, which contains hexavalent chromium, is a substance classified as carcinogenic, mutagenic and toxic for reproduction. It is listed as entry 22 in Annex XIV of REACH. A manufacturer, importer or downstream user must not place a substance on the market for a use, or use it himself, if that substance is included in Annex XIV, unless the use of that substance on its own or in a mixture or the incorporation of the substance into an article for which the substance is placed on the market or for which he uses the substance himself has been authorised.

Under Article 5(1)(a) of the RoHS Directive, exemptions are to be included in Annexes III and IV only if this does not weaken the environmental and health protection afforded by REACH.

In February 2019, the applicant for the current RoHS exemption also submitted an application for authorisation under REACH for a use of sodium chromate as an anticorrosion agent of the carbon steel in the sealed circuit of gas absorption appliances up to 0.7% by weight (as hexavalent chromium (Cr(VI)) in the refrigerant solution. It was found in the technical evaluation that the same maximum concentration can apply for a potential RoHS exemption entry. The Committee for Risk Assessment concluded that the risk management measures and operational conditions described in the application, and further detailed by the applicant at the Committee's request, are expected to be appropriate and effective to limit the risk to workers and to the general population through the environment. However, it recommended a set of monitoring arrangements for worker exposure and emissions to the environment.

The Committee for Socio-economic Analysis, in its analysis, concluded that there are clear net losses to society if the authorisation is not granted. The main impacts were seen to relate to lost profits, energy saving and reduced carbon dioxide emissions. This Committee also concluded that there were no suitable alternative substances or technologies available at the time of adoption of its opinion (11 June 2020). As reflected in the opinions of both the Committee for Risk Assessment and the Committee for Socio-economic Analysis, the gas absorption appliances to which the content of the application refers, including the analysis of alternatives, are limited to gas absorption heat pumps only.

An exemption under the RoHS Directive allowing the placing on the market of GAHPs containing hexavalent chromium does not, as such, affect that authorisation requirement under Regulation (EC) 1907/2006, nor would the granting of an authorisation under Regulation (EC) 1907/2006 affect the need to obtain an exemption under Directive 2011/65/EU. While

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<sup>8</sup> OJ L 197 24.7.2012, p. 38.

the authorisation process for the above-mentioned application is ongoing, no reasons for refusal of such authorisation were raised related to compliance with REACH conditions for granting an authorisation. Therefore, it can be concluded in this specific case that an exemption under the RoHS Directive does not weaken the environmental and health protection afforded by REACH.

Other heating technologies that eliminate the use of hexavalent chromium in the form of sodium chromate cannot offer equivalent functionality and performance. Research efforts aiming at reducing the hexavalent chromium content and/or substituting or eliminating hexavalent chromium under the same conditions will foreseeably require more than 5 years. This conclusion is in line with the findings under the REACH authorisation process<sup>9</sup>.

In the context of the assessment under the RoHS Directive, and given the current unavailability of practicable substitution technologies, the main aspect of relevance relates to assessing the impact caused by substitution and elimination against the benefits provided by GAHPs containing hexavalent chromium. From the technical evaluation, it became clear that the technology can save CO<sub>2</sub> by replacing conventional technologies; such savings are even more important when fossil-free, renewable energies are used.

Under reasonable conditions, the environmental and health risks of using hexavalent chromium can be limited to an acceptable level. Environmentally sound waste treatment technologies are available for the refrigerant solution and GAHPs system and safety precautions must be taken when assembling and disassembling any GAHP including hexavalent chromium.

Overall, it is concluded that the total benefits of granting the exemption are likely to outweigh the negative impacts.

### **3. LEGAL ELEMENTS OF THE DELEGATED ACT**

The proposed act grants an exemption from the substance restrictions in Annex II to Directive 2011/65/EU, to be listed in Annex III, for hexavalent chromium as an anticorrosion agent of gas absorption heat pumps.

The evaluation shows that the exemption to be granted would not weaken the environmental and health protection afforded by the REACH Regulation, in accordance with Article 5 of Directive 2011/65/EU.

At least one of the relevant criteria specified in Article 5(1)(a) is met. Given the current unavailability of practicable substitutes for the use of hexavalent chromium as an anticorrosion agent, the total negative environmental, health and consumer safety impacts caused by substitution or elimination are likely to outweigh the total environmental, health and consumer safety benefits of the requested application. Therefore, the exemption is to be granted and an expiry date is to be set.

Research efforts to find possibilities for reducing the hexavalent chromium content and/or to substitute or eliminate hexavalent chromium will foreseeably require more than 5 years seen from the time of the technical evaluation. It is therefore appropriate to grant the maximum five-year validity period for this exemption. The date by which this exemption will expire is set in line with Article 5(2), first subparagraph.

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<sup>9</sup> [Committee for Risk Assessment \(RAC\), Committee for Socio-economic Analysis \(SEAC\) - Opinion on an Application for Authorisation for sodium chromate as an anticorrosion agent \(...\)](#)

A similar exemption, exemption 9(a)-II in Annex III, allows hexavalent chromium in cooling systems of absorption refrigerators. The exemption is currently under review. Although this entry and the present requested exemption are based on the same physical principle, the final use differs, which, among others, justified the applications being assessed separately against the criteria of Article 5(1)(a).

It is proposed to add a new entry 9(a)-III for the relevant application in Annex III. Since the GAHPs described in the exemption request fall under category 1 ‘large household appliances’ of Annex I, the scope of the exemption should be limited to those.

The legal instrument is a delegated directive, as provided for in Directive 2011/65/EU and meeting the relevant requirements of its Article 5(1)(a).

The objective of the delegated directive is to protect human health and the environment, and to harmonise provisions for the functioning of the single market in the field of electrical and electronic equipment, by allowing the use of otherwise banned substances for specific applications, in line with the RoHS Directive and the procedure established therein for adapting Annexes III and IV to the Directive to scientific and technical progress.

The delegated directive has no implications for the EU budget.

COMMISSION DELEGATED DIRECTIVE (EU) .../...

of **XXX**

**amending, for the purposes of adapting to scientific and technical progress, Annex III to Directive 2011/65/EU of the European Parliament and of the Council as regards an exemption for hexavalent chromium as an anticorrosion agent in gas absorption heat pumps**

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment<sup>1</sup>, and in particular Article 5(1), point (a), thereof,

Whereas:

- (1) Directive 2011/65/EU requires Member States to ensure that electrical and electronic equipment placed on the market does not contain the hazardous substances listed in Annex II to that Directive. That restriction does not apply to certain exempted applications listed in Annex III to that Directive.
- (2) The categories of electrical and electronic equipment to which Directive 2011/65/EU applies are listed in Annex I to that Directive.
- (3) Hexavalent chromium is a restricted substance listed in Annex II to Directive 2011/65/EU.
- (4) On 23 December 2020, the Commission received an application made in accordance with Article 5(3) of Directive 2011/65/EU for an exemption to be listed in Annex III to that Directive, for the use of hexavalent chromium as an anticorrosion agent in the working fluid of the carbon steel sealed circuit of gas absorption heat pumps ('the requested exemption').
- (5) Gas absorption heat pumps require electricity for auxiliary functions like pumping a working fluid through the system. The gas absorption heat pumps described in the requested exemption fall under category 1 'large household appliances' of Annex I to Directive 2011/65/EU.
- (6) The evaluation of the exemption application, which included a technical and scientific assessment study<sup>2</sup>, concluded that substitution of hexavalent chromium in the refrigerant solution is currently scientifically and technically impracticable, and other heating technologies eliminating the use of hexavalent chromium in the form of sodium chromate cannot offer equivalent functionality and performance. Gas

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<sup>1</sup> OJ L 174, 1.7.2011, p. 88.

<sup>2</sup> [Study to assess requests for renewal of 12 exemptions to Annex IV of Directive 2011/65/EU - Review of request for amendment of exemption III-9: final report.](#)

absorption heat pumps can indeed provide higher energy efficiency than condensing boiler technologies, can help to replace those systems and can lead to carbon dioxide emission savings. That evaluation thus concluded that at least one of the relevant conditions specified in Article 5(1), point (a), of Directive 2011/65/EU is met, namely that the total negative environmental, health and consumer safety impacts of substituting hexavalent chromium in the uses covered by the exemption application are likely to outweigh the total environmental, health and consumer safety benefits thereof. The evaluation included stakeholder consultations as required by Article 5(7) of Directive 2011/65/EU. The comments received during those consultations were made publicly available on a dedicated website.

- (7) A maximum concentration of 0,7% hexavalent chromium by weight in the refrigerant solution is considered as sufficient for the requested exemption.
- (8) The placing on the market for a use and the use of substances listed in Annex XIV to Regulation (EC) No 1907/2006<sup>3</sup> are subject to an authorisation requirement under that Regulation. That Annex lists a number of hexavalent chromium compounds, including sodium chromate. Regulation (EC) No 1907/2006 and Directive 2011/65/EU apply without prejudice to each other. The use of a hexavalent chromium compound listed in Annex XIV to Regulation (EC) No 1907/2006 and its placing on the market for a use is subject to authorisation under that Regulation. The granting of an exemption under Directive 2011/65/EU does not affect that authorisation requirement under Regulation (EC) 1907/2006, nor would the granting of an authorisation under Regulation 1907/2006 affect the need to obtain an exemption under Directive 2011/65/EU. No reasons have been found according to which granting the requested exemption under Directive 2011/65/EU would weaken the environmental and health protection afforded by Regulation (EC) No 1907/2006.
- (9) It is, therefore, appropriate to grant the requested exemption by including the applications covered by it in Annex III to Directive 2011/65/EU with respect to electrical and electronic equipment of category 1.
- (10) Research efforts to find possibilities for reducing the hexavalent chromium content and/or to substitute or eliminate the use of hexavalent chromium will foreseeably require more than 5 years. Thus, it is appropriate to grant the requested exemption until 31 December 2026, in accordance with Article 5(2), first subparagraph, of Directive 2011/65/EU.
- (11) Directive 2011/65/EU should therefore be amended accordingly,

HAS ADOPTED THIS DIRECTIVE:

#### *Article 1*

Annex III to Directive 2011/65/EU is amended as set out in the Annex to this Directive.

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<sup>3</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, p. 1).

### *Article 2*

1. Member States shall adopt and publish, by [OP please insert the date: the last day of the sixth month after the date of entry into force of this Directive] at the latest, the laws, regulations and administrative provisions necessary to comply with this Directive. They shall forthwith communicate the text of those provisions to the Commission.

They shall apply those provisions from [OP please insert the date: the last day of the sixth month after the date of entry into force of this Directive + 1 day].

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

### *Article 3*

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

### *Article 4*

This Directive is addressed to the Member States.

Done at Brussels,

*For the Commission*  
*The President*  
*Ursula VON DER LEYEN*