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**Guidance note on Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EC, and repealing Directives 2004/8/EC and 2006/32/EC**

**Article 14: Promotion of efficiency in heating and cooling**

*Accompanying the document*

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## ARTICLE 14: PROMOTION OF EFFICIENCY IN HEATING AND COOLING

### A. INTRODUCTION

1. Article 14 of the Energy Efficiency Directive<sup>1</sup> (hereafter 'the EED' or 'the Directive') extends the scope and replaces the substantive provisions of Directive 2004/8/EC<sup>2</sup> on the promotion of cogeneration (hereafter 'the CHP Directive'). This document therefore covers the new provisions and will only address provisions of the CHP Directive as necessary to facilitate the understanding of the new Directive.
2. The overall objective of Article 14 is to encourage the identification of cost effective potential for delivering energy efficiency, principally through the use of cogeneration, efficient district heating and cooling and the recovery of industrial waste heat or, when these are not cost-effective, through other efficient heating and cooling supply options, and the delivery of this potential. Member States are required to identify the potential for high-efficiency cogeneration and efficient district heating and cooling and to analyse the costs and benefits of the opportunities that may exist. Article 14(4) then requires Member States to take adequate measures to ensure these are developed if there is cost-effective potential.
3. The Directive defines high-efficiency cogeneration, efficient district heating and cooling and efficient individual heating and cooling supply options. These definitions are found in Article 2(34), (41) and (43) respectively. These together represent all the types of efficient heating and cooling that Article 14 seeks to promote. The concept of efficient heating and cooling is defined in Article 2(42).
4. Efficient heating and cooling encompasses principally the use of heat from cogeneration and renewable energy sources<sup>3</sup>, the recovery of waste heat from industrial processes to meet demand for heating and cooling<sup>4</sup>, and in general all those heating and cooling options that achieve primary energy savings compared to a baseline scenario<sup>5</sup>. It is therefore a comprehensive concept that covers all heating and cooling options<sup>6</sup> in line with the general definition of energy efficiency provided in the Directive<sup>7</sup>.

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<sup>1</sup> Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, OJ L 315, 14.11.2012, p. 1.

<sup>2</sup> Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC OJ L 52, 21.2.2004, p. 50–60

<sup>3</sup> See points 41, 42 and 43, the first sub-paragraph of Article 14(4) and Annex IX.1(b).

<sup>4</sup> The recovery of waste heat from industrial processes can be implemented with cogeneration or through feeding the heat to a district heating and cooling network or through using the waste heat on site to meet an economically justifiable demand for heating and cooling.

<sup>5</sup> The definition of 'efficient heating and cooling' in Article 2(42) sets primary energy saving, *i.e.* the reduction of primary energy input needed to supply one unit of delivered energy, as the main criterion of efficiency.

<sup>6</sup> Article 2(42): '*efficient heating and cooling*' means a heating and cooling option that, compared to a baseline scenario reflecting a business-as-usual situation, measurably reduces the input of primary energy needed to supply one unit of delivered energy within a relevant system boundary in a cost-effective way [... ]'.

<sup>7</sup> The definition of energy efficiency in Article 2(2) is the following: '*energy efficiency*' means the ratio of output of performance, service, goods or energy, to input of energy'.

5. Article 14 requires Member States to comply with the following **main obligations**:

- **Carry out and notify by 31 December 2015** to the Commission a **comprehensive assessment** of the potential for the application of high efficiency cogeneration and efficient district heating and cooling **based on a country-wide cost-benefit analysis** following the methodology set out in Part 1 of Annex IX and containing the information set out in Annex VIII. The assessment should be updated every five years, if the Commission asks for this at least one year before the due date.
- **Take adequate measures** for efficient district heating and cooling infrastructure to be developed and/or to accommodate the development of high-efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources, **where the comprehensive assessment identifies a potential whose benefits exceed the costs** for the application of high efficiency cogeneration and efficient district heating and cooling.
- **Adopt policies in relation to local and regional levels** that encourage the due taking into account of the potential of using efficient heating and cooling systems, including the potential identified in the comprehensive assessment.
- **Adopt authorisation or permit criteria and procedures** for operators of electricity generation installations, industrial installations and district heating and cooling installations ensuring that they carry out an installation-level **cost-benefit analysis** on the use of high-efficiency cogeneration and/or the utilisation of waste heat and/or connection to a district heating and cooling network when they plan to build or refurbish capacities above 20 MW thermal input or when they plan a new district heating and cooling network. The procedure and criteria must also lay out the conditions for exemption from the obligation to prepare a cost-benefit analysis, if the Member State decides to use the exemptions allowed under paragraph 6 (see Section F, points 70-74).

The adopted procedure may specify exemptions based on the comprehensive assessment (and country-wide cost-benefit analysis), if applicable (see section F, point 76).

The procedure should in any case specify how *ad hoc* exemptions from implementing the outcome of the cost-benefit analyses will be granted under paragraph 8 of Article 14, if a Member States decides to permit those exemptions.

Accordingly, the procedure and criteria should at least include the following:

- i. A requirement to prepare a cost-benefit analysis when a new installation with a total thermal input of 20 MW is planned or is substantially refurbished or when a new district heating and cooling network is planned (specifying exemption conditions under paragraphs 4, and 6, if applicable);

- ii. The methodology, including the assumptions and time horizons, and the procedure for the cost-benefit analysis to be carried out for installations, on the basis of the methodology set out in Annex IX, 2;
  - iii. A definition of how the results of the comprehensive assessment and the country-level cost-benefit analysis should be taken into account in the authorisation or permit criteria.
6. In terms of chronological order, the legal transposition measures should be accomplished by the following dates:
- a. **Notify exemptions** from the cost-benefit analysis for installations as referred to in Article 14(6) **by 31 December 2013**;
  - b. **Require installations** referred to in Article 14(5) **to carry out a cost-benefit analysis** each time a new installation is planned or an existing installation is refurbished **starting from 5 June 2014**;
  - c. **Notify the comprehensive assessment** referred to in Article 14(1) **by 31 December 2015**;
  - d. **Notify the update of the comprehensive assessment every five years** at the request of the Commission made at least one year before the due date.
7. Member States should notify their legal provisions transposing the Directive into national law using the 'NIF' database. To ensure an efficient transfer of information Member States are also encouraged to use the 'NIF' database for the notifications mentioned above.
8. The note presents the Commission's services' understanding of how the relevant provisions of the EED are to be interpreted. It aims to enhance legal certainty but does not create any new rules. In any event, giving binding interpretation of European Union law is ultimately the role of the European Court of Justice. The present note is not legally binding.
9. This note aims to provide guidance to Member States on how to apply Article 14 of the EED. The note states the views of the Commission, does not alter the legal effects of the Directive and is without prejudice to the binding interpretation of Article 14 as provided by the Court of Justice.

## **B. THE COMPREHENSIVE ASSESSMENT**

10. According to Article 14(1), *'By 31 December 2015, Member States shall carry out and notify to the Commission a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling, containing the information set out in Annex VIII.'*

11. The comprehensive assessment must be based on a cost-benefit analysis covering the Member State's territory and taking into account climate conditions, economic feasibility and technical suitability in accordance with Part 1 of Annex IX<sup>8</sup>.
12. This section addresses the purpose of the comprehensive assessment and the information it must contain. It also provides elements of guidance on how to carry it out.
13. The purpose of the comprehensive assessment is to produce clear results to deliver energy efficiency in heating and cooling. These results should be reflected in the information notified to the Commission. They can be divided into mandatory and optional elements.
14. The mandatory information to be provided relates to the potential for high-efficiency cogeneration and efficient district heating and cooling identified on the basis of the country-level cost-benefit analysis and on the measures Member States intend to take to achieve that potential (Article 14(2) and (4))<sup>9</sup>. In addition, Member States may include, as optional elements, information on the potential for other efficient heating and cooling systems, such as efficient individual heating and cooling supply options identified as positive alternative scenarios when conducting the country-level cost benefit analysis<sup>10</sup>.
15. Member States are free to decide the form in which they express the potential. A logical way of presenting it would be to indicate at least the following: additional expected demand for heat and cooling by sectors; the potential for additional new and refurbished production capacities in MW; additional production of heat and electricity in MWh. For district heating and cooling this capacity and production data would be *mutatis mutandis* presented and complemented with the following indicators: the additional length of pipelines; the new area covered; the number of new connected consumers and the quantity of heat or cooling to be delivered in MWh from cogeneration, renewable energy, waste heat and other supply source categories<sup>11</sup>. To allow for assessment of the size of the potential, the figures mentioned above would also logically be expressed in relative terms, *i.e.* in percentages comparing the additional capacities, production and consumption, pipelines length and area covered to the base year, indicating an increase or decrease.

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<sup>8</sup> Article 14(3): '*For the purpose of the assessment referred to in paragraph 1, Member States shall carry out a cost-benefit analysis covering their territory based on climate conditions, economic feasibility and technical suitability in accordance with Part 1 of Annex IX.*'

<sup>9</sup> Article 14(1): '*... a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling, containing the information set out in Annex VIII.*

Article 14(4): '*Where the assessment referred to in paragraph 1 and the analysis referred to in paragraph 3 identify a potential for the application of high-efficiency cogeneration and/or efficient district heating and cooling whose benefits exceed the costs, Member States shall take adequate measures for efficient district heating and cooling infrastructure to be developed and/or to accommodate the development of high-efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources [...].*'

<sup>10</sup> The country-level cost benefit analysis should be '*capable of facilitating the identification of the most resource /and cost-efficient solutions to meeting heating and cooling needs and in general to help promote efficiency in heating and cooling, including efficient individual heating and cooling*' (Article 14(3), first and second paragraph and point (d) of Annex IX.1).

<sup>11</sup> The capacity should be expressed in MW<sub>e</sub> for electricity and MW<sub>th</sub> for heat. The production of heat and electricity and the quantity of supplied heat and cooling should be expressed in MWh<sub>e</sub> for electricity and MWh<sub>th</sub> for heating and cooling. Member States can additionally provide heat production and supply quantities in GJ.

16. Member States must adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, taking account of the potential for developing local and regional heat markets (Article 14(2))<sup>12</sup>. They may use the comprehensive assessment to define this potential in addition to those for high-efficiency cogeneration and efficient district heating and cooling.
17. The comprehensive assessment must cover the information listed in points (a) to (j) of Annex VIII. It must describe a Member State's heating and cooling demand<sup>13</sup>. It must provide a forecast of how this demand will evolve in the next 10 years<sup>14</sup>. It must include a heat map that identifies significant demand and supply points for heating and cooling<sup>15</sup> and existing and planned district heating and cooling infrastructures<sup>16</sup>. The assessment must identify the heating and cooling demand that could be satisfied by high-efficiency cogeneration, residential micro-cogeneration and district heating and cooling<sup>17</sup>. Taking the heating and cooling demand as a starting point, it should then identify the potential for additional high-efficiency cogeneration, *i.e.* from building new capacities; from refurbishing existing electricity generation and industrial installations; and from other facilities generating waste heat<sup>18</sup>; as well as the potential for developing efficient district heating and cooling infrastructures to accommodate the development of high-efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources<sup>19</sup>.

Based on the identified potential, the assessment should provide information on the measures, strategies and policies that may be adopted to achieve the potentials up to 2020 and 2030<sup>20</sup>. The adoption of measures is only mandatory if the assessment identifies a potential whose benefits exceeds the costs.

The assessment should also give estimates of the value of public support measures to heating and cooling broken down by annual earmarked budget, if such support is planned, and an estimate of the primary energy to be saved by those measures<sup>21</sup>.

Finally, the assessment must include an explanation and comparison of how the potentials and measures identified under the comprehensive assessment relate to the potentials and progress achieved under the CHP Directive.

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<sup>12</sup> Article 14(2): '*Member States shall adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high-efficiency cogeneration. Account shall be taken of the potential for developing local and regional heat markets.*'

<sup>13</sup> See point (a) of Annex VIII.1.

<sup>14</sup> See point (b) of Annex VIII.1.

<sup>15</sup> See point 1 (c)(i) and (ii) of Annex VIII.

<sup>16</sup> See point 1 (c)(ii) of Annex VIII.

<sup>17</sup> See point 1 (d) of Annex VIII.

<sup>18</sup> See point 1 (e) of Annex VIII.

<sup>19</sup> See point 1 (f) of Annex VIII.

<sup>20</sup> See point 1(g) of Annex VIII and Article 14(4).

<sup>21</sup> See point 1 (i) and (j) of Annex VIII.

18. Member States are free to decide how to prepare the comprehensive assessment and can draw on assessments or cost-benefit analysis already prepared under other European or national initiatives. A logical approach would be as follows:

- **First**, establish the heat and cooling demand of the country<sup>22</sup>. The description of the heat demand should relate to real, *i.e.* measured and verified, consumption information as provided in national and European energy statistics and national energy balances. It should be provided in a detailed sectoral and geographical break-down, and in any case not less detailed than in relevant European energy statistics. It should provide information about the consumption of the industrial, services, agricultural and household sectors. The description of heat demand should be based on the latest available data. Since official statistical information at the time of the notification deadline of 31 December 2015 will probably be available only for 2013, this can be used as the default base year for the projections made for the purpose of the comprehensive assessment.
- **Second**, prepare a forecast of how this demand will evolve in the next 10 years. This forecast should take into account the trends in the major sectors of the economy. It should analyse the likely evolution of heat demand in industrial sectors, taking into account longer term structural trends (such as de-industrialisation or re-industrialisation or efficiency improvements and the impact of new production technologies) as well as shorter term cyclical changes. The evolution of heat demand in buildings should be given specific consideration, including an analysis of the impact of energy efficiency improvements in buildings, such as those required under the Energy Performance of Buildings Directive (2010/31/EU)<sup>23</sup> and the EED.
- **Third**, prepare a map of the national territory that identifies at least the main supply and demand points above certain consumption or production thresholds, and the existing and planned district heating and cooling infrastructures. The thresholds are listed in points (i) and (iii) of Annex VIII.1(c). For heating demand, municipalities and conurbations with a plot ratio of at least 0.3<sup>24</sup> and industrial zones with a total annual heating and cooling consumption of more than 20 GWh should be shown in the map. For production, electricity generation installations with a total annual electricity production of more than 20 GWh, waste incineration plants and cogeneration plants of all technology types should be shown. Both existing and planned demand and supply points should be presented on the map.
- **Fourth**, based on the identified heat demand and heat demand forecast, Member States will have to identify those elements of the heat demand that technically could be satisfied by high-efficiency cogeneration, micro-cogeneration and efficient district-heating and cooling. This means establishing the maximum or technical potential.

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<sup>22</sup> A reference to heat and heating should normally be understood as a reference to heating and cooling.

<sup>23</sup> Directive 2010/31/EU on the energy performance of buildings, OJ L 153, 18.6.2010, p. 13.

<sup>24</sup> An area with a plot ratio of 0.3 currently corresponds to a linear heat density of 2.5 MWh/m, since the current specific heat demand is about 130 kWh/m<sup>2</sup>. This is a threshold indicating areas where expert literature considers district heating directly feasible. In France, there were some 176 city districts in 31 cities with a plot ratio higher than 0.3 in 2001. At the same time 82 city districts had a higher than 0.3 plot ratio in Paris. (Linear heat density is the quota of heat annually sold and the total trench length of the district heating pipe system.)



- **Fifth**, Member States will have to identify those parts of the technical potential that can economically be met by high-efficiency cogeneration, including residential micro-cogeneration, by the refurbishment of existing and the construction of new generation and industrial installations, by utilising waste heat, and by refurbishing and building district-heating and cooling infrastructures meeting the efficient district heating definition of the Directive<sup>25</sup>. This is the potential whose benefits exceed the costs. It is the only potential that needs to be achieved (see especially Article 14(3) and Annex IX). This potential can be called the economic potential.

Establishing the economic potential will not be possible without cost-benefit analysis. Article 14(3) therefore requires Member States to carry out a cost-benefit analysis for the purposes of the comprehensive assessment. The cost-benefit analysis is covered in section C below. The requirement for establishing the infrastructure potential is expressed in point (f) of Annex VIII.1, which states that [the potential to be identified by Member States under Article 14(1) also includes the] '*energy efficiency potentials of district heating and cooling infrastructure*'.

- **Sixth**, based on the economic potential, Member States will have to define strategies, policies and measures that may be adopted up to 2020 and up to 2030.

When doing so, Member States will have to bear in mind their obligation, in the event that a cost beneficial potential is identified in their comprehensive assessment, to take adequate measures for efficient district heating and cooling infrastructure to be developed and/or to accommodate the development of high efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources, as required by Article 14(4). In the event that potential with a cost-benefit surplus is not identified in the comprehensive assessment, Member States have no obligation to take measures in the sense of Article 14(4). When the cost-benefit surplus is not sufficient to cover the administrative costs of carrying out the cost-benefit analysis for an installation referred to in Article 14(5), Member States are not required to take measures in relation to that installation; they may however still need to take other types of measures that are adequate to ensure the achievement of the identified potential.

Member States should also adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular high-efficiency cogeneration and taking into account the potential for developing local and regional heat markets, as required under Article 14(2).

19. In addition, and further to the second sub-paragraph of Article 14(4), should a Member State find and indicate to the Commission that the comprehensive assessment has not found cost-effective potential in some or all regions of its territory, then an exemption from the requirements of Article 14(5) may be applied to installations situated in those regions.

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<sup>25</sup> See Article 2(41)

20. According to the last sentence of Article 14(3), Member States may use cost-benefit analyses carried out under Directive 2001/42/EC. This is to ease the administrative burden. If an environmental impact assessment conducted under Directive 2001/42/EC provides equivalent analysis to that required under Annex VIII and IX, it can be used for the purposes of the comprehensive assessment.

### C. THE COUNTRY-LEVEL COST-BENEFIT ANALYSIS

21. The comprehensive assessment cannot be prepared without carrying out cost-benefit analysis. This is necessary in order to identify the economic potential, that is to say cost-efficient solutions for meeting heating and cooling demand.

22. According to Article 14(3) and the first paragraph of Annex IX.1, the country-level cost-benefit analysis conducted as part of the comprehensive assessment must be capable of facilitating the identification of the most resource- and cost-efficient solutions to meeting heating and cooling needs<sup>26</sup>, and in general of helping promote efficiency in heating and cooling<sup>27</sup>. It must help decision making and provide a decision base for prioritisation of limited resources<sup>28</sup>. It must provide an instrument to establish the most cost-effective and beneficial heating and cooling options in a given geographical area for the purpose of heat planning<sup>29</sup>.

23. Article 14(4) and Part 1 of Annex IX establish the purpose and the scope of the cost-benefit analysis. They set out the range of heat and cooling options that need to be examined and lay down methodological principles to ensure the quality of the analysis.

24. The country-level cost-benefit analysis is an economic analysis that must cover all relevant social, economic and environmental factors<sup>30</sup>. It should be based on the analysis of a comprehensive inventory of effects<sup>31</sup>.

25. The principle of comprehensiveness is reflected in the requirements that the total long-term costs and benefits of a heating and cooling option should be assessed<sup>32</sup>. Therefore, geographical and system boundaries<sup>33</sup> and the time horizons<sup>34</sup> of projects or groups of projects must be set in such a way that all relevant costs and benefits are included in the analysis.

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<sup>26</sup> Article 14(3): *'The cost-benefit analysis shall be capable of facilitating the identification of the most resource- and cost-efficient solutions to meeting heating and cooling needs'*.

<sup>27</sup> This more general mandate is reflected in the purpose of the cost-benefit analysis that should support the comprehensive assessment. The first paragraph of Annex IX.1 reads: *'The purpose of preparing cost-benefit analyses in relation to measures for promoting efficiency in heating and cooling as referred to in Article 14(3) is to provide a decision base for qualified prioritisation of limited resources at society level.'*

<sup>28</sup> Annex IX, Part 1, first sentence.

<sup>29</sup> Annex IX, Part 1, second paragraph.

<sup>30</sup> *'Cost-benefit analyses for the purposes of Article 14(3) shall include an economic analysis covering socio-economic and environmental factors.'* (Third paragraph of Annex IX, Part 1);

<sup>31</sup> *'The economic analyses shall take into account all relevant economic effects.'* (Point (g) of Annex IX.1)

<sup>32</sup> *'The total long-term costs and benefits of heat or cooling supply options shall be assessed and compared.'* (Point (e) (i) of Annex IX, Part 1).

<sup>33</sup> *'The cost-benefit analysis shall take into account all relevant supply resources available within the system and geographical boundary, using the data available, including waste heat from electricity generation and*

26. The cost-benefit analysis should cover the entire territory of a Member States<sup>35</sup>. It could – in practical terms – be carried out by a series of cost-benefit analyses for projects or groups of projects in the framework of local/regional assessments<sup>36</sup>. It should take into account climate conditions, economic feasibility and technical suitability<sup>37</sup>.
27. The cost-benefit analysis should be used to establish the potential of high-efficiency cogeneration and efficient district heating and cooling. However, to arrive at sound results, the analysis should consider and compare alternative scenarios covering the full range of efficient heating and cooling supply options. This follows from the requirement that only high-efficiency cogeneration, efficient district heating and cooling and efficient individual heating and cooling supply options should be assessed as alternative to the baseline situation<sup>38</sup> and from the more general requirement that the analysis must be capable of facilitating the identification of the most resource and cost-efficient solutions to meeting heating and cooling needs<sup>39</sup>.
28. Part 1 of Annex IX requires Member States to establish and make public the procedure for the cost-benefit analysis. This means that they need to define by whom, how and on the basis of which assumptions the cost-benefit analysis will be carried out. Member State must designate the competent authorities responsible for carrying out the cost-benefit analyses. They must ensure that the analysis has both an economic and a financial analysis included. They can assign these tasks to local, regional and national authorities and even to operators of individual installations or distribute the tasks among different actors. They must provide detailed methodologies, and assumptions on the prices of major input and output factors and on the discount rate – for use in establishing the baseline (*i.e.* reference) and alternative scenarios<sup>40</sup>.
29. These requirements are defined in the last paragraph of Annex IX. Part 1 as follows: *'Member States shall designate the competent authorities responsible for carrying out the cost-benefit analyses under Article 14. Member States may require competent local, regional and national authorities or operators of individual installations to carry out the economic and financial analysis. They shall provide the detailed methodologies and assumptions in accordance with this Annex and establish and make public the procedures for the economic analysis.'*

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*industrial installations and renewable energy, and the characteristics of, and trends in heat and cooling demand.'* (Point (b) of Annex IX.1) See also the second sentence of point (a) of Annex IX.1: *'The geographical boundary shall cover a suitable well-defined geographical area, e.g. a given region or metropolitan area, to avoid selecting sub- optimised solutions on a project by project basis.'*

<sup>34</sup> *'The time horizon shall be chosen such that all relevant costs and benefits of the scenarios are included. For example, for a gas-fired power plant an appropriate time horizon could be 25 years, for a district heating system, 30 years, or for heating equipment such as boilers 20 years'* (Point (e) (iii) of Annex IX.1).

<sup>35</sup> Article 14(3): *'For the purpose of the comprehensive assessment [...] Member States shall carry out a cost-benefit analysis covering their territory based on climate conditions, economic feasibility and technical suitability [...].'*

<sup>36</sup> *'The cost-benefit analysis may either cover a project assessment or a group of projects for a broader local, regional or national assessment in order to establish the most cost-effective and beneficial heating or cooling option for a given geographical area for the purpose of heat planning.'*(Second paragraph of Annex IX.1).

<sup>37</sup> Article 14(3), see above.

<sup>38</sup> Annex IX.Part 1.(d).

<sup>39</sup> Article 14(3), second sentence.

<sup>40</sup> Annex IX, Part 1, last paragraph.

30. As regards the methodology for preparing the cost-benefit analysis, the steps to be taken are described in Part 1 of Annex IX.
31. The **first step** is to identify the **system and geographical boundary** for a given project or group of projects, which defines the scope of the analysis.
32. Within a given geographical boundary all relevant supply resources and characteristics and trends in heat and cooling demand need to be taken into account, including the current situation and future trends in the selected time frame. This means that not only existing heating and cooling supply should be looked at, but other energy flows within the geographical boundary, *i.e.* electricity production and distribution facilities, gas networks and other primary energy supply sources, including renewable energy, industrial energy production and waste (surplus) heat from industrial processes. Only when all supply and heat and cooling demand sources are identified and their possible evolution forecast can there be an assessment of how these energy flows can be optimised and made more efficient, looking first at the possibility of using (additional) high-efficiency cogeneration and efficient district heating and cooling, then if these would not yield cost-benefit surplus under a socio-economic analysis, then at other efficient heating and cooling supply options, such as efficient individual heating and cooling. This is because the fundamental purpose of the cost-benefit analysis is to identify '*the most cost-effective and beneficial heating or cooling option for a given geographical area for the purpose of heat planning*'<sup>41</sup>. The cost-benefit analysis should therefore be understood as comprehensive energy system planning that covers all relevant technical and economic options. This is expressed in point (b) of Annex IX. Part 1.
33. The **second step** is to construct a **baseline scenario**. The baseline scenario should describe the existing situation and its likely evolution in the selected timeframe, if no parameters of the existing situation are changed, *i.e.* the business-as-usual or reference scenario. A critical element of the baseline scenario, and a key to a successful cost-benefit analysis, is to describe the heat and cooling demand within the geographical boundary as precisely as possible. The collection of accurate, reliable and comprehensive heat and cooling data may be a challenge but is necessary if a Member State is to ensure high quality cost-benefit analyses and a sound decision base for the comprehensive assessment. If the data gathered for the purposes of the cost-benefit analysis are also used for the information required under points (a)-(c) of Annex VIII, no disclosure is needed beyond the level of detail required in the heat map and taking into account the need of preserving commercially sensitive information<sup>42</sup>.
34. The **third step** is to identify **alternative scenarios**. When doing so, Member States have to consider the relevant possibilities for how heating and cooling can be made more efficient.<sup>43</sup> The Directive provides guidance on what should be considered 'relevant' possibilities, *i.e.* '*relevant alternatives to the baseline*'. Member States must examine cogeneration and district heating and cooling first. Only when and to the extent that these are not technically or economically feasible, taking into account long-term costs and benefits within a given geographical boundary, should Member States proceed with examining other efficient heating

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<sup>41</sup> Annex IX.1, second paragraph.

<sup>42</sup> Annex VIII., point (c).

<sup>43</sup> Annex IX.1, point (d), first sentence: '*All relevant alternatives to the baseline shall be considered.*'

and cooling solutions, such as efficient individual heating and cooling<sup>44</sup>. For the purpose of the comprehensive assessment's cost-benefit analysis, Member States can only take into account alternative scenarios that satisfy the definitions of high-efficiency cogeneration, efficient district heating and cooling and efficient individual heating in particular and the general concept of efficient heating and cooling in general<sup>45</sup>.

35. The definition of high-efficiency cogeneration is the same as under the CHP Directive. High-efficiency cogeneration must achieve at least 10% primary energy savings compared to separate heat and electricity production<sup>46</sup>.

The calculation methodologies required to establish which cogeneration can be considered high-efficiency, including the related calculation of when electricity can be considered as being produced from cogeneration, are set out in Annexes I and II of the EED, which incorporate entirely Annexes II and III of the CHP Directive. Commission Decision 2008/952/EC, establishing detailed guidelines on the calculation methodology of the quantity of electricity from cogeneration set out in Annex II of the Cogeneration Directive, also remains in force and applicable under the Directive<sup>47</sup>. For the purposes of comparison with separate heat and electricity production, the reference values established in Commission Implementing Decision 2011/877/EU are to be used<sup>48</sup>.

36. Only realistic scenarios need to be examined. Scenarios can be excluded if they are not feasible due to technical reasons, financial reasons or time constraints or because they conflict with national law<sup>49</sup>. Financial and time constraint reasons should be in line with the general principles of the country-level cost-benefit analysis in Part 1 of Annex IX. Accordingly, scenarios that would likely produce a cost-benefit surplus under the broad socio-economic and environmental analysis (economic analysis) should not be excluded for financial or time constraint reasons, even if those would likely produce a negative cost-benefit balance under the financial analysis.

37. Once the baseline and alternative scenarios are constructed, Member States must set an appropriate time horizon to ensure that no relevant cost to society is omitted when balancing the costs and benefits. This follows from the requirement of comprehensiveness, *i.e.* that the economic analyses must take into account all relevant economic effects<sup>50</sup> and from the requirement that the total long-term costs and benefits of heat and cooling supply options must

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<sup>44</sup> This follows from the mandatory content of the comprehensive assessment as set in Article 14(1).

<sup>45</sup> Annex IX, Part 1, point (d), second paragraph: '*Only high-efficiency cogeneration, efficient district heating and cooling or efficient individual heating and cooling supply options should be taken into account in the cost-benefit analysis as alternative scenarios compared to the baseline.*' See also the definitions in points (31), (41), (42) and (43) of Article 2 of Directive 2012/27/EU.

<sup>46</sup> Annex III, point (a), second intend of Directive 2004/8/EC and Annex II, point (a), second intend of Directive 2012/27/EU.

<sup>47</sup> Commission Decision 2008/952/EC establishing detailed guidelines for the implementation and application of Annex II to Directive 2004/8/EC of the European Parliament and of the Council, OJ L 338, 17.12.2008, p.55

<sup>48</sup> Commission Implementing Decision 2011/877/EU establishing harmonised efficiency reference values for separate production of electricity and heat in application of Directive 2004/8/EC of the European Parliament and of the Council and repealing Commission Decision 2007/74/EC, OJ L 343, 23.12.2011, p. 91.

<sup>49</sup> Annex IX, Part 1, point (d): '*All relevant alternatives to the baseline shall be considered. Scenarios that are not feasible due to technical reasons, financial reasons, national regulation or time constraints may be excluded at an early stage of the cost-benefit analysis if justified based on careful, explicit and well-documented considerations.*'

<sup>50</sup> Annex IX, Part 1 point (g).

be assessed and analysed when calculating the cost-benefit surplus<sup>51</sup>. This can be achieved only if a sufficiently long time horizon is chosen, which typically will be the lifetime of an item of infrastructure or equipment. The time horizon will be specific to each project or group of projects, but Member States can set typical or standard lifetimes for similar projects for the sake of simplicity.

38. The Directive provides some examples, such as the likely appropriate time horizon for a gas-fired power plant, a district heating system and heating equipment<sup>52</sup>. Member States could set other, longer or shorter, lifetimes if this is justifiable on technical and economic grounds or needed to cover all relevant costs and benefits to society.

The examples given in point (iii) of Annex IX.1(e) show that the appropriate time horizon should not be confused with the payback time.

When examining scenarios for efficient heating and cooling, including efficient individual heating and cooling, the costs of energy required for extraction, conversion, transport and distribution should be factored into the cost-benefit calculation, as required by the definitions in Article 2(42) and (43)<sup>53</sup>.

39. The valuation criterion must be the net present value (NPV)<sup>54</sup>. That does not mean that Member States cannot use other valuation methods. However all assessed projects and scenarios have to be assessed and compared at least under the NPV criterion.

40. NPV analysis requires as input a list of costs and benefits expressed in monetary units. These costs and benefits will have to be discounted at an appropriate discount rate. NPV above zero indicates a cost benefit analysis with a positive result or a surplus in excess of costs, while project with a negative NPV would generate costs in excess of benefits.

41. For the economic analysis, Member States must establish a comprehensive list of input and output factors and costs and benefits to be taken into account in the calculations. A non-exhaustive inventory is provided in Annex IX, Part 1, point (g). Member States must use actual price information for the calculations. They must forecast how these prices would evolve over the selected timeframe and provide price assumptions<sup>55</sup>. Since the cost-benefit analysis is an

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<sup>51</sup> Annex IX, Part 1, points (e) and (i).

<sup>52</sup> Annex IX, Part 1, point (e)(iii).

<sup>53</sup> The definition of efficient heating and cooling' in Article 2(42) reads: '*efficient heating and cooling*' means a heating and cooling option that, compared to a baseline scenario reflecting a business-as-usual situation, measurably reduces the input of primary energy needed to supply one unit of delivered energy within a relevant system boundary in a cost-effective way, as assessed in the cost-benefit analysis referred to in this Directive, taking into account the energy required for extraction, conversion, transport and distribution.'

The definition of efficient individual heating and cooling in Article 2(43) reads: '*efficient individual heating and cooling*' means an individual heating and cooling supply option that, compared to efficient district heating and cooling, measurably reduces the input of non-renewable primary energy needed to supply one unit of delivered energy within a relevant system boundary or requires the same input of non-renewable primary energy but at a lower cost, taking into account the energy required for extraction, conversion, transport and distribution.'

<sup>54</sup> Annex IX, Part 1, point (e) (ii).

<sup>55</sup> 'Member States shall provide assumptions, for the purpose of the cost-benefit analyses, on the prices of major input and output factors and the discount rate.' (Annex IX, Part 1, points (f) and (i)).

economic analysis, all relevant long-term impacts of the project, including externalities, should be included to the extent possible. This is expressed in Annex IX, Part 1, point (f)(iv) which reads: *'The prices used in the economic analysis shall reflect the true socio economic costs and benefits and should include external costs, such as environmental and health effects, to the extent possible, i.e. when a market price exists or when it is already included in European or national regulation.'* There will be costs and benefits for which either no market exists or the market is incomplete and therefore the price does not reflect the true social value<sup>56</sup>. Where no market price is available and European or national regulation do not give guidance on that external cost Member States should to the extent possible, but are not required to, provide estimates assigning a value for the costs or benefits to society. These estimations can be based on relevant and accepted economic theories, expressing explicitly the trade-offs associated with the different uses of the economic and natural resources at a societal level. As an example, the social benefits can be estimated on the basis of the generally well accepted methods of revealed or stated preferences, whereas the costs may be defined as the opportunity costs, *i.e.* the value that the resources used would have received in the best alternative use. When there is a market price, but it does not reflect the true social costs, Member States may use correction factors, such as taxation, as far as these have an impact on market actors' decisions and are not only internal transfers.

42. The Directive specifically mentions network impacts as factors that may be included in the cost-benefit analysis.<sup>57</sup> For example, a refurbished power plant converted to cogeneration for the purpose of district heating and supplying both heat and electricity to nearby consumers, while also providing balancing services to grid operators, may reduce operational and investment costs in electricity networks and generation through less power grid congestion, less need to expand the network and reduced need for peak load and back-up generation capacities, etc.; an alternative green field investment in an electricity-only plant may have additional costs to build or reinforce electricity networks, from higher network losses due to longer transport distances, and higher costs of producing the same amount of heat separately that would otherwise have been available as a by-product of electricity generation. Potential higher network losses from higher grid loads, even if seasonal in nature, ensuing from certain individual heating solutions (e.g. increase in electric heating or air source heat pumps) should also be taken into account. Electricity and other network impacts therefore need to be considered in the baseline and alternative scenarios in accordance with the requirements of Article 15 on network efficiency.

43. Member States must also define the discount rate to be used in the calculation<sup>58</sup>. When they choose the discount rate for the calculation, they must use European and national guidelines and take into account data provided by the European Central Bank<sup>59</sup>.

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<sup>56</sup> *'The prices used in the economic analysis shall reflect the true socio economic costs and benefits and should include external costs, such as environmental and health effects, to the extent possible, i.e. when a market price exists or when it is already included in European or national regulation.'* (Annex IX, Part 1, point 1 (e) (iv)).

<sup>57</sup> *'Member States may assess and take into account in decision making costs and energy savings from the increased flexibility in energy supply and from a more optimal operation of the electricity networks, including avoided costs and savings from reduced infrastructure investment, in the analysed scenarios.'* (Annex IX, Part 1, point (g), second paragraph).

<sup>58</sup> *'Member States shall provide assumptions, for the purpose of the cost-benefit analyses, on the prices of major input and output factors and the discount rate.'* (Annex IX, Part 1, points (f) (i)).

<sup>59</sup> Annex IX, Part 1, point (f) (ii).

44. The analysis should also include a sensitivity analysis to gauge the impact of possible variations in the most important factors, such as different scenarios for development of heating and cooling demand, different discount rates, different energy prices and changes in other major input and output prices<sup>60</sup>.

#### **D. THE INSTALLATION-LEVEL COST-BENEFIT ANALYSIS**

45. A core requirement under Article 14 is for Member States to ensure that operators of electricity generation, industrial installations and district heating and cooling installations listed in point (a) to (d) of paragraph (5) carry out a cost-benefit analysis when they plan building new or substantially refurbishing energy production capacities above 20 MW thermal input to assess the cost-effectiveness of using high-efficiency cogeneration, recovering waste heat and connecting to a district heating and cooling network. The results of the cost-benefit analysis must be taken into account in authorisation or permit criteria issued to those installations in accordance with Article 14(7). Part 2 of Annex IX sets out the principles for the installation-level cost-benefit analyses that will provide information for measures required under Article 14(5) and (7).
46. The cost-benefit analysis under Article 14(5) for installations '*shall include an economic analysis covering a financial analysis reflecting actual cash flow transactions*'<sup>61</sup>. In contrast to the country-level cost-benefit analysis described in Part 1 of Annex IX, where the emphasis is on the economic analysis with a well-defined methodology and accent on socio-economic and environmental factors, the installation-level analysis described in Part 2 of Annex IX places more weight on the financial analysis. This analysis must reflect actual cash flows from investing in and operating individual installations. This is because the outcome of this analysis should be reflected in authorisation/permitting decisions impacting on the economic activity of the installations.
47. However, the installation-level analysis has to be embedded in the context of a broader economic analysis. The economic analysis may be provided either from the cost-benefit analysis conducted under the comprehensive assessment or by the operators of the installations. Part 2 of Annex IX requires Member States to set out guiding principles for the methodology, assumptions and time horizons for the economic analysis.
48. Annex IX Part 2 indicates that both '*existing and potential heat demand points that could be supplied*' should be considered in the cost benefit assessment. Clearly, potential heat load points may still not exist at the time the installation is commissioned. The cost benefit assessment and authorisation may therefore need to be made on the basis that the installation is equipped to operate as cogeneration/waste heat recovery (rather than actually operating as such at the time of commissioning) and capable of supplying the potential heat loads once they exist. This case arises when based on the comprehensive assessment there are clear perspectives, *i.e.* measures, policies or strategies, that the heat load will come to existence, *e.g.* the district heating or cooling network or the missing equipment will be realised and the connection with the heat consumer(s) will be made as part of a project or groups of projects whose benefits exceeded the costs under country-level cost-benefit analysis conducted according to Part 1 of Annex IX.

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<sup>60</sup> Annex IX, Part 1, point (h).

<sup>61</sup> Annex IX.2, eighth paragraph.



49. It is recommended that Member States adopt detailed guidance on the cost-benefit assessments to ensure consistent application of this requirement across sites. In addition to the criteria mentioned in Article 14(6) it is recommended that the guidance establish common assumptions on payback periods, required rates of return on investment, projected fuel and electricity prices, policy costs and support levels. These assumptions should be used in the economic analysis unless the applicant can provide evidence to demonstrate that alternative assumptions are appropriate in the case of their installation. In line with the requirements of Part 2 of Annex IX these assumptions should realistically reflect actual investment terms for projects.
50. The Directive does not specify who should be responsible for overseeing and for conducting the cost-benefit analysis. A common sense solution would be to assign the task of carrying out the analysis to the operators of installations, while Member States would designate competent authorities responsible for providing the common methodology, assumptions and timeframes for at least the economic analysis and would also ensure that the assessments are well-founded.
51. As regards the participants in the cost-benefit analysis, the third sub-paragraph of Article 14(5) provides that Member States may require the cost-benefit analysis conducted under points (c) and (d) of Article 14(5) to be carried out in cooperation with the companies responsible for the operation of the district heating and cooling networks. This provision aims to ensure coordination between district heating companies and industrial installations when assessing options of cogeneration and of recovering waste heat.
52. Member States may also choose to be more involved, for example by helping coordinate with interested parties, such as consumers and district heat companies, or data gathering<sup>62</sup>. This would have the benefit of creating possibilities of synergies between the Annex IX Part 1 and Part 2 cost-benefit analyses.

## **E. AUTHORISATION AND EQUIVALENT PERMIT PROCEDURES FOR INSTALLATIONS**

53. Article 14(7) requires Member States to adopt authorisation criteria or equivalent permit criteria ensuring that installations referred to in points (a)-(c) of Article 14(5) carry out a cost-benefit analysis and that the outcome of that cost-benefit analysis together with the outcome of the comprehensive assessment is taken into account in authorisations and permit criteria.
54. '*Authorisation and equivalent permit criteria*' means criteria setting conditions for the construction and/or operation of a power generation or industrial installation. Authorisation and permitting criteria are therefore conditions the competent authorities should define in a legally binding decision (*i.e.* an authorisation, permit or license decision) on the conditions under which a new or existing installation is allowed to be built, operate and/or modified (refurbished). Member States are free to decide in which permitting or authorisation procedure they integrate the criteria listed in points (a) to (c) of Article 14(7). This can be an existing authorisation procedure under Directive 2009/72/EC or a permitting procedure under Directive 2010/75/EU<sup>63</sup> or any other equivalent procedure, including a newly established one, if some

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<sup>62</sup> Annex IX.2, last paragraph.

<sup>63</sup> Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17.12.2010

categories of electricity generation or industrial installations under Article 14(5) would not otherwise be covered by an obligation to obtain an authorisation or permit when they are built or substantially refurbished<sup>64</sup>.

55. For the following installations their respective authorisation or permit criteria must reflect the requirements of Article 14(7):

1. New thermal electricity generation installation, when planned;
2. Existing thermal electricity generation installation, when substantially refurbished;
3. Industrial installation generating waste heat at a useful temperature level, when planned;
4. Industrial installation generating waste heat at a useful temperature level, when substantially refurbished;
5. New district heating and cooling network, when planned;
6. New energy production installation, when planned in an existing district heating or cooling network;
7. Existing energy production installation, when substantially refurbished in an existing district heating or cooling network.

56. Substantial refurbishment is defined both in a positive and a negative way. According to Article 2(44), '*substantial refurbishment*' means a refurbishment whose cost exceeds 50% of the investment cost for a new comparable unit<sup>65</sup>. However, refurbishment that is related to the fitting of equipment to capture carbon dioxide produced by a combustion installation with a view to its being geologically stored as provided for in Directive 2009/31/EC does not qualify as refurbishment and therefore does not trigger the cost-benefit analysis obligation under Article 14(5) of the Directive<sup>66</sup>.

57. As regards the definition of the concept of '*installation with a total thermal input exceeding 20 MW thermal input*', Member States are free to follow their national definitions taking into account their definitions established under relevant European law, in particular the Industrial Emissions Directive (2010/75/EU), the EU Emissions Trading Directive (2003/87/EC)<sup>67</sup> and the Electricity Directive (2009/72/EC)<sup>68</sup>. Under the EED this concept covers all combustion installations. When calculating the total thermal input of an installation the rated thermal inputs of all technical units which are part of it and in which fuels are combusted within the installation should be added together.

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<sup>64</sup> The words '*authorisation*' and '*permit*' are used interchangeably. They are synonym with each other and with the word '*licence*', as long as they mean a decision by a competent authority on the technical, design and operation conditions of a new or substantially refurbished installation.

<sup>65</sup> Article 2(44).

<sup>66</sup> '*The fitting of equipment to capture carbon dioxide produced by a combustion installation with a view to its being geologically stored as provided for in Directive 2009/31/EC shall not be considered as refurbishment for the purpose of points (b), (c) and (d) of this paragraph.*' (Article 14(5), second sub-paragraph)

<sup>67</sup> Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, OJ L 275, 25.10.2003, p. 32–46

<sup>68</sup> Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, OJ L 211, 14.8.2009, p. 55–93

58. As regards new installations, the cost-benefit analysis obligation should be integrated in the authorisation or permit criteria when an installation is planned. The concept of 'planned' should be interpreted in the light of the purpose of the Directive, which is to make energy production and consumption more efficient and save energy through improving energy efficiency. An installation is in the '*planned*' stage, when an operational decision is considered which has an impact on its design and operational parameters and thus the energy efficiency performance. The planned stage is therefore the decision making phase where the authorisation or equivalent permit on the building or the operation of an installation is under consideration and decided by the competent authorities. Such an authorisation or permitting decision has to take into account the results of the cost-benefit analysis. The cost-benefit analysis is therefore part of the authorisation and equivalent permitting procedure<sup>69</sup>.
59. As regards existing installations, the cost-benefit analysis obligation should be integrated in the authorisation or permit criteria when there is a substantial refurbishment. Such a refurbishment should be subject to the installation's authorisation and permits being modified to take into account the new construction and the changes in operation. The authorisation and permits should reflect the outcome of the cost-benefit analysis conducted under Article 14(5).
60. It follows from Article 14(7) that authorisation and permit procedures must include the following requirements:
1. An obligation to prepare a cost-benefit analysis for installations covered under points (a)-(d) of Article 14(5);
  2. An explanation of how the outcome of cost-benefit analysis of installations is to be taken into account in the authorisation and permit criteria;
  3. An explanation of how the outcome of the comprehensive assessment is to be taken into account in the authorisation and permit criteria;
  4. Specification of the conditions for granting installations the exemptions from the cost-benefit analysis obligation that may be available under Article 14(6) (nuclear installations, installations that need to be located close to geological storage site approved under Directive 2009/31/EC, peak load/back-up electricity generating installations and based on thresholds of available waste heat, heat demand and distance from district heating networks), if a Member State decides to allow such exemptions;
  5. Specification of the exemption conditions, including the imperative reasons of law, ownership or finance, for those cases where an installation level cost-benefit analysis is carried out and shows a positive outcome but the authority decides to waive the obligation of implementing that outcome.
61. Member States may also choose to specify the conditions for granting installations the exemptions from the cost-benefit analysis obligation available under the second sub-paragraph of Article 14(4) (on the basis of the comprehensive assessment) in their authorisation or permit procedures, if a Member States decides to allow such exemptions.

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<sup>69</sup>For the concept of authorisation and permit see footnote 63.

62. The Directive requires that installations must carry out the cost-benefit analysis referred to in Article 14(5) after 5 June 2014. The authorisation and permit procedures that include the cost-benefit analysis obligation for installations must therefore be in place by 5 June 2014, *i.e.* the transposition date of the Directive. This cost-benefit analysis obligation applies to installations with an authorisation or permit decision pending after 5 June 2014, with the exemption of those installations that fall under an exemption granted according to paragraph 4 or 6 of Article 14.
63. Authorisation and equivalent permit decisions will meet the requirements of Article 14(7) only when the outcome of both the comprehensive assessment and the installation level cost-benefit analysis is fully reflected. However, the outcome of the comprehensive assessment may not be available and thus reflected in the authorisation/permit decisions before 31 December 2015 (the deadline of its notification to the Commission, reflecting the substantial time that may be needed to prepare the comprehensive assessment in a proper way), while Member States must oblige installations to carry out a cost-benefit analysis under Article 14(5) already after 5 June 2014. Furthermore, exemptions from the cost-benefit analysis for installations that Member States may grant on the basis of the comprehensive assessment may also not be available and thus included in the authorisation/permit procedures until the comprehensive assessment is completed.

Member States may, but are not required to, issue authorisations or permits that are in full conformity with Article 14(7) before 31 December 2015.

After 5 June 2014, Member States must consider the installation-level cost-benefit analysis when issuing an authorisation or permit for an installation, even if the national comprehensive assessment is not yet available.

64. As the authorisations and permits should reflect the outcome of the installation-level cost-benefit analysis under Article 14(5) already from 5 June 2014, when the results of the comprehensive assessment are not yet available, Member States may overcome the time lag between the date of the installation-level cost-benefit analysis obligation and the comprehensive assessment by bringing forward the date by which the comprehensive assessment is completed and notified to the Commission.
65. Article 14(9) states that the installations' cost-benefit analysis obligation and the related exemptions under paragraph 6, the permit criteria under paragraph 7 and the related exemptions under paragraph 8 are to apply without prejudice to the requirements of Directive 2010/75/EU on industrial emissions. Directive 2012/27/EU and Directive 2010/75/EU both aim at promoting the energy efficiency of industrial installations, in particular through promoting cogeneration, the recovery of waste heat and district heating and cooling, which are recognised as Best Available Techniques (BAT) under Article 13 of Directive 2010/75/EU. Directive 2012/27/EU provides an implementation mechanism for these specific BAT. Furthermore, permitting procedures under Directive 2012/27/EU can be integrated with permitting procedures under Directive 2010/75/EU. Authorisation and permit criteria under Article 14(7) of Directive 2012/27/EU may be included in the permit conditions of installations that are required under Article 14 of Directive 2010/75/EU. However, the implementation of Article 14 of Directive 2012/27/EU does not require or depend upon the implementation of the provisions of Directive 2010/75/EU. In case of conflict, the provisions of Directive 2010/75/EU should apply.

66. The purpose of the cost-benefit analysis (CBA) for installations is to establish whether using high-efficiency cogeneration and/or recovering waste heat in district heating and cooling networks would be cost-effective<sup>70</sup>.
67. Waste heat is the heat that results from an industrial or power generation process before it is transformed into useful heat. The Directive defines useful heat in relation to cogeneration in point 32 of Article 2. Only the recovery of waste heat at useful temperature level needs to be considered for the purposes of the cost-benefit analysis<sup>71</sup>.
68. Where, under the cost-benefit assessment, there are options for developing an installation in a way which provides for cogeneration, waste heat recovery and connection to a district heating and cooling network that yield a positive outcome, such options should be reflected in the authorisation and permit. An application for a power-only or new heat-only installation should not therefore be authorised/ permitted, subject to the exemptions discussed below.
69. Positive cost-benefit outcomes of the installation-level cost-benefit analysis are those where the sum of discounted benefits in the economic and financial analysis exceeds the sum of discounted costs<sup>72</sup>. Based on the comprehensive analysis, Member States may have identified that the economic analysis yields a positive result, while installation level financial analyses may be negative. If the Member States then adopt measures in the sense of Article 14(4) and Annex VIII.1.(g), the financial value of these measures may be included in the cost-benefit analysis for the purposes of installations under Part 2 of Annex IX.

## F. EXEMPTIONS FROM THE COST-BENEFIT ANALYSIS FOR INSTALLATIONS

70. Member States may exempt installations covered by Article 14(5) from undertaking the installation-level cost-benefit analysis under certain conditions. There are two exemption paths: one according to Article 14(6) and one according to Article 14(4).
71. Under **Article 14(6)** Member States may **exempt four types of installations**:

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<sup>70</sup>The cost-benefit analysis' objective is defined specifically for each type of installation under Article 14(5). This for new planned power plants is '*... to assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation*'; for power when refurbished is '*... to assess the cost and benefits of converting it to high-efficiency cogeneration*', for industrial installations planned or under refurbishment is '*...to assess the cost and benefits of utilising the waste heat to satisfy economically justified demand, including through cogeneration, and of the connection of that installation to a district heating and cooling network*'; for district heating networks and new or refurbished energy generation plants is '*... to assess the cost and benefits of utilising the waste heat from nearby industrial installations*'.

<sup>71</sup> The reference to useful temperature level means that heat that does not have sufficient energy content to enable its utilisation does not need to be considered. The concept of useful temperature level is however not a static concepts and depends, *inter alia*, on the range of available technologies for recovery, their costs and the price of the heat to be supplied. It is for the cost-benefit analysis to define what the useful temperature level in light of these technical and economic parameters is.

<sup>72</sup> Annex IX.2, ninth paragraph.

- Peak load and back-up electricity generating installations planned to operate under 1500 operating hours per year as a rolling average over a period of five years<sup>73</sup>;
- Nuclear power installations<sup>74</sup>;
- Installations that need to be located close to a geological storage site approved under Directive 2009/31/EC<sup>75</sup>;
- Industrial installation and district heating installations covered by points (c) and (d) of Article 14(5)<sup>76</sup>.

If Member States decide to use one or more of these exemptions they must notify them to the Commission by 31 December 2013. They must also notify any subsequent changes to them thereafter<sup>77</sup>.

72. The exemption of nuclear installations does not require further justification beyond showing that they are what they are.
73. The exemption of '*installations that need to be located close to a geological storage site*' may only be applied to installations that have set aside space for the equipment necessary to capture and compress CO<sub>2</sub>, in order to feed the CO<sub>2</sub> into a geological storage site with a valid storage permit granted under Directive 2009/31/EC and are located close to this geological storage site<sup>78</sup>.
74. Peak load and back-up electricity generating installations planned to operate under 1500 operating hours per year as a rolling average over a period of five years can only be exempted if a Member State provides together with the exemption notification the verification procedure that ensures that the exemption conditions are met. The verification procedure must be able to justify that the limit of 1500 operation hours per year as a 5-year rolling average will be observed.
75. The second sub-paragraph of Article 14(6) states that Member States may lay down thresholds – expressed in terms of the amount of available useful waste heat, the demand for heat or the distances between industrial installations and district heating networks – for exempting industrial and district heating installations under Article 14(5)(c) or (d) from the cost-benefit analysis obligation. For this exemption to be available, Member States must lay down the thresholds that justify the use of the exemption and notify them to the Commission<sup>79</sup>.

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<sup>73</sup> See point (a) of Article 14(6).

<sup>74</sup> See point (b) of Article 14(6).

<sup>75</sup> See point (c) of Article 14(6).

<sup>76</sup> See second sub-paragraph of Article 14(6).

<sup>77</sup> Article 14(6), last sub-paragraph.

<sup>78</sup> See Article 33 of Directive 2009/31/EC for the requirement to perform CCS-readiness assessment and, if appropriate, to set aside a suitable space for carbon capture and compressing equipment; see Chapter 3 of Directive 2009/31/EC for the details on storage permits.

<sup>79</sup> In the case of exemptions granted on the ground of the second sub-paragraph of paragraph 6 for installations covered under points (c) and (d) of paragraph 5, Member States should provide the thresholds (quantity of

76. The Commission should be capable of reviewing the continued need for the exemptions under Article 14(6) based on the Member States' notifications, as provided for in Article 24(5)<sup>80</sup>.
77. Under **Article 14(4)** there is an **additional possibility** for Member States **to exempt installations** from the cost-benefit analysis. This should be based on the comprehensive assessment and justified through the country-level cost-benefit analyses. If the comprehensive assessment shows that e.g. in a given region there is no potential whose benefits exceed the costs, including administrative cost, they may exempt installations from doing the cost-benefit analysis.

#### **G. RELATIONSHIP BETWEEN COMPREHENSIVE ASSESSMENT AND INSTALLATION-LEVEL OBLIGATIONS**

78. Article 14 creates several links between the comprehensive assessment and the obligations of the operators of installations. One link, established in the second sub-paragraph of Article 14(4), is that the comprehensive assessment can be the basis to give exemption for installations from the cost-benefit analysis obligation, where there is no positive cost-benefit outcome.
79. The cost-benefit analyses carried out under Article 14(5), and the consideration of the results of those in authorising or permitting new or refurbished installations under Article 14(7), may follow on from or complement the comprehensive assessment referred to in Article 14(4) and must contribute to its delivery - *i.e.* they are part of the '*adequate measures*' that Member States are required to take.
80. The second link, established in the first paragraph of Article 14(4), requires that the adequate measures taken on the basis of the comprehensive assessment must be in accordance with the installation-level obligations under Article 14(5) and 14(7). Accordingly, if there is a potential whose benefit exceeds the costs, the adequate measures should also cover installations under Article 14(5). The concept of adequate measure therefore also includes issuing authorisation and permit criteria or decisions for new or refurbished installations using cogeneration or recovering waste heat via district heating and cooling networks. The same link is contained in Article 14(7), which requires that Member States must adopt authorisation and equivalent permit criteria that take into account both the outcome of the comprehensive assessment and the outcome of the installation-level cost-benefit analysis.
81. In addition, Member States may create synergies between the country-level cost benefit analysis conducted under the comprehensive assessment and the installation-level cost-benefit analysis. For example a common set of assumptions or common basic calculation methodologies could be used while putting the focus on different considerations, e.g. the cash flow analysis in the case of installations or the wider economic analysis in the case of the

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available useful heat, size of the heat demand and the distances) with an explanation on how those were arrived at and why those thresholds justify the granting of the exemption.

<sup>80</sup> The notification by Member States of the exemptions under Article 14(6) must be sufficiently detailed and specific to allow the Commission to review the continued need for the possibility of those exemptions already in the assessment of the first National Energy Efficiency Action Plans due by 30 April 2014, and every three years thereafter, as required by Article 24(5).

country-level analysis. The economic analysis under the comprehensive assessment can waive the need for an economic analysis for the purposes of the installation-level cost-benefit analysis or provide a context or a background.