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Annex 10. Equivalence report according to Article 15 (3) of the EPBD

Article 15 of the current EPBD¹ has been implemented in Denmark by alternative measures, cf. paragraph 3 of that article.

This note compares the expected impact of the alternative measures for the period from 15 March 2023 to 15 March 2026 with the expected effect during the same period of implementation of an inspection scheme according to paragraph 1 of the article.

Summary

The expected effects are shown in the table below.

Table 1 *Expected impact of implementation under paragraph 1 and alternative measures*

	Year [TJ/year] Accumulated 2023-2026 [TJ]	
Effect of inspection pursuant to paragraph 1	1,20	3,60
<i>The Business Pool</i>	0,70	2,10
<i>Requirements in the Building</i>	0,49	1,46
<i>Circular on EE in state institutions</i>	0,46	1,38
Overall impact of alternative	1,65	4,94

The assumptions and method of calculation of the effect of implementation under paragraph 1 are set out in Section 1 below, while the corresponding effect of the alternative measures is described in Section 2.

In addition to the alternative measures mentioned in Table 1, Denmark has information and advice measures, mainly via SparEnergi.dk and the Knowledge Centre for Energy Savings in Buildings, which can be expected to have an effect that can be partly equivalent to that of a monitoring system under paragraph 1. However, this effect has not been attempted to quantify, given that the expected impact of the other three measures already exceeds the expected impact of a supervisory regime under paragraph 1.

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¹ See Article 15(3) of Directive 2010/31/EU of 19 May 2010 on the energy performance of buildings (EPBD), as last amended by Directive (EU) 2018/844 of 30 May 2018.

1)

The effect of implementation in accordance with paragraph 1;

1a)

Energy consumption for space cooling in the relevant installations

The rules laid down in Article 15 shall apply to *“air conditioners or combined air-conditioning and ventilation systems with an effective rated output of over 70kW”*. Only local space cooling installations in buildings are included, excluding district cooling, industrial, retail, etc.

There is no central registration of refrigeration systems in Denmark, neither in general nor specifically for space cooling. However, the energy needs for space cooling have been assessed in the reports entitled “Mapping energy consumption in industry”² (Energy Agency 2015) and “Sharing energy consumption to end uses in trade and services” (Transition 2019).

In the latest equivalence report, the Technological Institute estimated, on the basis of the sources mentioned above, that cooling systems for space cooling with an output of more than 70 kW had an electricity consumption of approximately 1.323 TJ/year. It is assumed that this consumption has increased by 6.7 %, corresponding to real GDP growth from 2019 to 2022, leaving it now around 1.416 TJ/year.

1b)

Installations exempted under paragraph 2

Paragraph 2 of that article provides that *“installations which are explicitly covered by an agreed energy performance criterion or by a contractual arrangement setting out an agreed level of energy efficiency improvement, such as an energy performance contract, or operated by an operator or a network operator”* are exempted from the inspection requirement in paragraph 1.

In the latest previous equivalence report, the Technological Institute considered that 54 % of space cooling systems with an output greater than 70 kW are covered by certified energy management under ISO50001 or statutory energy audits. Both of these schemes address possible energy efficiency measures in space cooling systems and the Danish Energy Agency considers that the installations are therefore also covered by the exemption in paragraph 2 above.

Assuming that the said share has not changed significantly and that the share of energy consumption covered by the derogation corresponds to that of installations, the energy consumption of installations which will have to be reviewed in a scheme under paragraph 1 will be 651 TJ/year.

1c)

The assessment of the impact of an inspection scheme in accordance with paragraph 1;

²[map egning af energy-saving potentialer i businesslivet.pdf \(ens.dk\)](#)

The Technological Institute considers that inspections pursuant to paragraph 1 would be able to demonstrate a 15 % savings potential in the installations covered. According to the Technological Institute, about 1/3 of the potential identified in voluntary inspection schemes is realised. Assuming that it would also be the case in a mandatory scheme that the mandatory inspection takes place once during the lifetime of the cooling system and that the lifetime is 20 years, this would lead to achieved energy savings of 1.63 TJ/year.

It is expected that mandatory inspection requirements will be extensively complied with. With a sample survey, the Institute of Technology has clarified the extent to which the existing inspection requirement linked to the Danish Working Environment Authority's rules on pressure equipment is being complied with. The survey showed almost 100 % compliance. It is likely to be most cost-effective to link these inspections to mandatory energy inspections in accordance with paragraph 1, and the high level of compliance may then also be maintained.

The said sample survey also showed that 90 % of the refrigeration systems inspected in accordance with the rules laid down by the Danish Working Environment Authority are also subject to a voluntary actual service inspection where the system is cleaned, replaced with wear parts, etc.

Overall, it is conservative that the mandatory inspection requirement under paragraph 1 will achieve a compliance rate of 75 %.

With the above ratio between potential and realised energy savings and the aforementioned assumptions regarding inspection frequency (every 20 years) and compliance rates, the energy savings achieved will be 1.2 TJ/year.

2)

Impact of alternative measures

The Business Pool

The Danish Business Pool grants Danish companies for projects that save energy and/or CO₂ emissions due to energy consumption, including projects relating to space cooling installations. Funds have been allocated to the pool in the coming years up to 2029.

In 2021 and 2022, 2 commitments were made for space cooling installations with a power of more than 70 kW. According to the information reported by the companies concerned, the 2 projects will result in a total annual saving of 1.4 TJ. It is expected that in each year of the reporting period, the scheme will generate additional savings equivalent to the average of what was achieved in 2021 and 2022, i.e. 0.7 TJ.

Requirements in the Building Regulations for new space cooling systems greater than 290 kW Section 295 of the Building Regulations have requirements relating to building automation, which include, inter alia, new space cooling systems larger than 290 kW. The requirements are national and are not the result of an EU directive.

The requirements require the automation to be able to:

- 1) continuously monitor and analyse energy consumption;

- 2) communicate with the technical installations and regulate these facilities in an energy efficient manner according to the needs of the building;
- 3) to express the energy efficiency of the building and its technical installations;
- 4) being able to detect system malfunctions and to inform operational staff of the defects.

It is considered that these requirements together result in an energy saving of 5 % compared to a situation without such requirements.

According to Danmarks Statistik, the increase in floor area for offices, hotels, restaurants, commerce, education and the like, where space cooling can be expected to some extent, amounted to 900.000 m² per year in the period from 2015 to 2019.

It is assumed that the annual growth rate during the reporting period will continue to be at this level and that active space cooling with installations of more than 290 kW will be established in 20 % of the area. Furthermore, according to the Technological Institute, it can be assumed that the average electricity consumption for cooling is 15 kWh/m²years. Thus, as mentioned above, an energy saving of 5 % would be 135.000 kWh each year, equivalent to 0.486 TJ.

Projects carried out in the first year will therefore produce the said savings during the second year of the period and projects carried out in the first two years a saving of 0.972 TJ during the third year of the period. A total of 1.46 TJ savings will thus be made during the reporting period.

Circular on energy efficiency in state institutions

The Circular requires ministries to reduce energy consumption of 42.480 MWh (153 TJ) in buildings owned and occupied by the central government in the period from 2021 to 2030. In addition, the energy consumption of all other buildings occupied by state institutions must have been reduced by 10 % in 2030.

The EU Energy Efficiency Directive requires a reduction in energy consumption in at least 30 % of the floor area of government buildings. The rules in the Danish circular result in such requirements for all floor areas used by the State. Denmark therefore over-implements 70 % of the floor area of the buildings in question. It is assumed that it can be considered as an alternative measure under Article 15 (3).

On the basis of an estimate of the energy consumption of public buildings carried out by the consultant Transition, it is estimated that 2 % is spent on space cooling and that 66 % of the cooling demand is covered by installations above 70 kW. Assuming that the share of circular total energy savings related to space cooling with installations above 70 kW corresponds to the share of these installations in the total energy consumption of public buildings, this would result in savings in these installations of a total of 392 MWh in 2030 compared to 2020. Assuming further that x savings from projects implemented in 2022, in 2023 2x savings from projects implemented in 2021 and 2021, in 2024 3x savings from projects implemented in 2022, 2021 and 2023 and so on, the savings in 2023, 2022 and 2025 would amount to a total of 98 MW, which is the same as 0.35 TJ.

In the calendar year 2020, the energy consumption of buildings occupied but not owned by the State was 123.9 GWh. It is also assumed that 70 % of energy consumption relates to the over-implementation of the Energy Efficiency Directive mentioned above, that 2 % of this consumption is used for space cooling and that 66 % of this consumption is covered by installations above 70 kW. Furthermore, assuming that the requirement to reduce energy consumption by 10 % in 2030 is precisely implemented in terms of consumption for space cooling, the savings in 2030 will be achieved. 2020 is 1.14 GWh. With the same assumption as above regarding the implementation of year-on-year savings, the savings in 2023, 2024 and 2025 would amount to a total of 0.285 GWh, which is the same as 1.03 TJ.

The above mentioned energy savings from the three alternative measures are included in Table 1 above.