Nykredit

Report

Top 15% of the most energy-efficient buildings according to the EU taxonomy

Nykredit Group & MOE

About this report

The EU Taxonomy Regulation has defined six environment objectives. According to the Taxonomy Regulation, an economic activity qualifies as “environmentally sustainable” if it makes a “substantial contribution” to at least one of the objectives. At the same time, the activity should “do no significant harm” to any of the other objectives, and it should comply with minimum “social safeguards”.

According to the delegated regulation on climate change mitigation, existing buildings, i.e.. buildings built before 2021, must have at least one Energy Performance Certificate (EPC) rating of A or be within the top 15% of the most energy-efficient buildings of the total national or regional building stock expressed as operational Primary Energy Demand (PED).

The calculation of the top 15% must at least compare the energy performance of the relevant assets with the performance of the national or regional stock built before 31 December 2020. Furthermore, the calculation must distinguish between residential and non-residential buildings. Since there are no regional regulations in Denmark, the national Danish Building Regulation applies to all regions.

The objective of this analysis is to define the criteria for a building in the Danish building stock to qualify for being within the top 15% of the most energy-efficient buildings. The criteria is based on the EPC and year of construction. The analysis includes buildings built before and after 2021, due to resolution of available data.
The analysis is performed in March 2023, and all information regarding EPCs and other data about the buildings are available at this point in time. The data used in this analysis have been extracted from statistics from the Danish Energy Agency and Statistics Denmark.

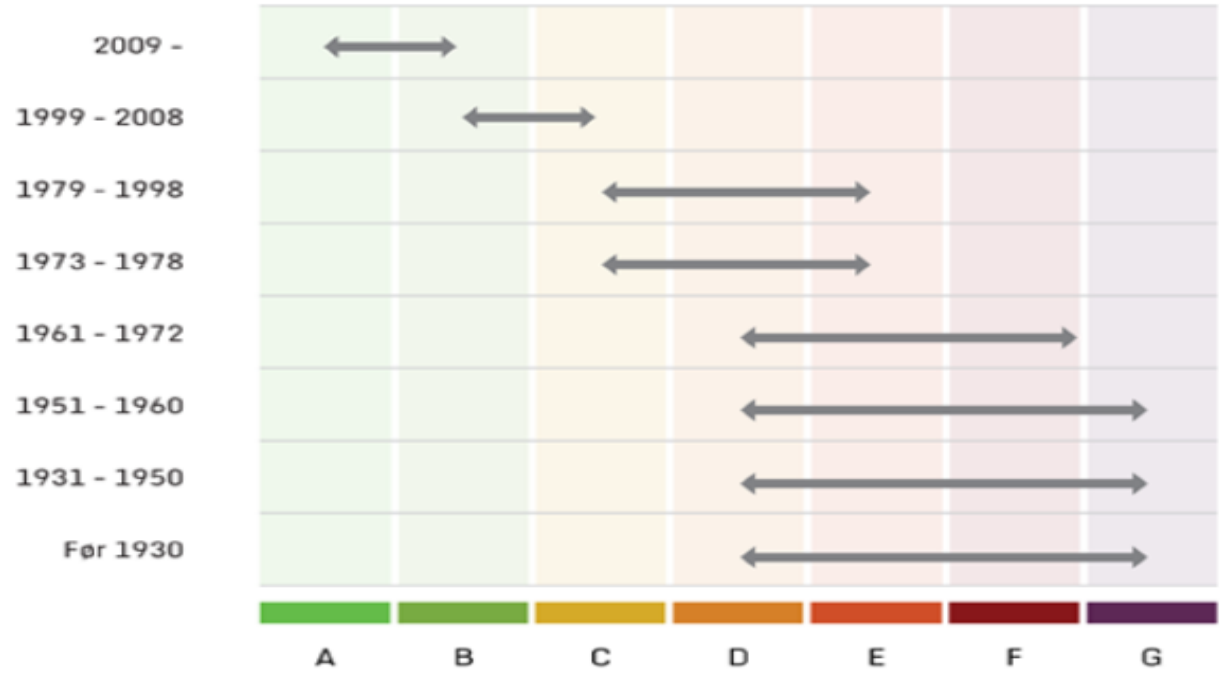
Energy-efficiency of buildings

Energy-efficiency of buildings may be defined in various ways. Preferably, the actual energy consumption of the building should provide the basis of the ranking. However, there are little data available publicly on the actual energy consumption of the buildings in Denmark, and the data are not enough to carry out sufficient analysis.

Instead, the EPC can be used as an energy-efficiency indicator. The EPC ranking system was introduced in Denmark in 1998. In 2009 the Danish Building Regulation was updated to include a requirement that new buildings must have a minimum EPC ranking of B. Already in 2010, this requirement was changed to a minimum ranking of A.

The EPC system in Denmark is based on a theoretical calculation of energy consumption under standard assumptions regarding user behavior and weather conditions. Hence, the EPC indicates the energy standard of the building, but not its actual consumption. The EPC system provides the best available basis for comparing the state and quality of different buildings. The calculation considers the current source of heating and contributions from renewable energy sources. A statement of the source of heating makes it possible to determine the building's primary energy requirement using national energy factors for electricity and district heating, respectively. So, the EPC reflects the aggregate primary energy consumption to be produced in order to operate the building.

Figure 1. Typical EPC rankings of buildings in Denmark based on the year of construction. (The Danish Energy Agency, 2022)



There is no reason to believe that this correlation between the year of construction and the EPC ranking is different for buildings without an EPC, which is why it may be assumed that this correlation also applies to buildings without a valid EPC. Thus, for buildings without a valid EPC, the identification of the top 15% will be based on the year of construction.

Method for identification

To identify the top 15%, this analysis will initially determine how large a share of buildings with a valid EPC to include in the top 15%. Afterwards, the construction year is used as indicator for buildings without a valid EPC. The calculation is based on the total floor area of the buildings. So, a building with a total floor area of 160 sqm weighs double that of a building with a floor area of 80 sqm. The calculation distinguishes between residential and non-residential buildings as prescribed in the EU taxonomy.

EPCs have been obtained from the Danish Energy Agency (The Danish Energy Agency, 2022), while the floor area of the buildings and the age distribution have been sourced from Statistics Denmark (Statistics of Denmark, 2022).

The analysis includes buildings built after 2021, as it is difficult to sort EPCs prior to 2021 from EPCs after 2021. This is a conservative consideration, and therefore it has been regarded as acceptable.

Residential buildings

The buildings included in this category are farmhouses for agricultural property, detached and semi-detached houses and terraced, chain and multi-story buildings.

Initially, it is assessed how large the share of buildings with a valid EPC is compared with the total national residential building stock in Denmark. This is presented in Figure 2 as the accumulated distribution. The energy-limits for each category have been added to the figure, corresponding to a residential building with an area of 150 sqm.

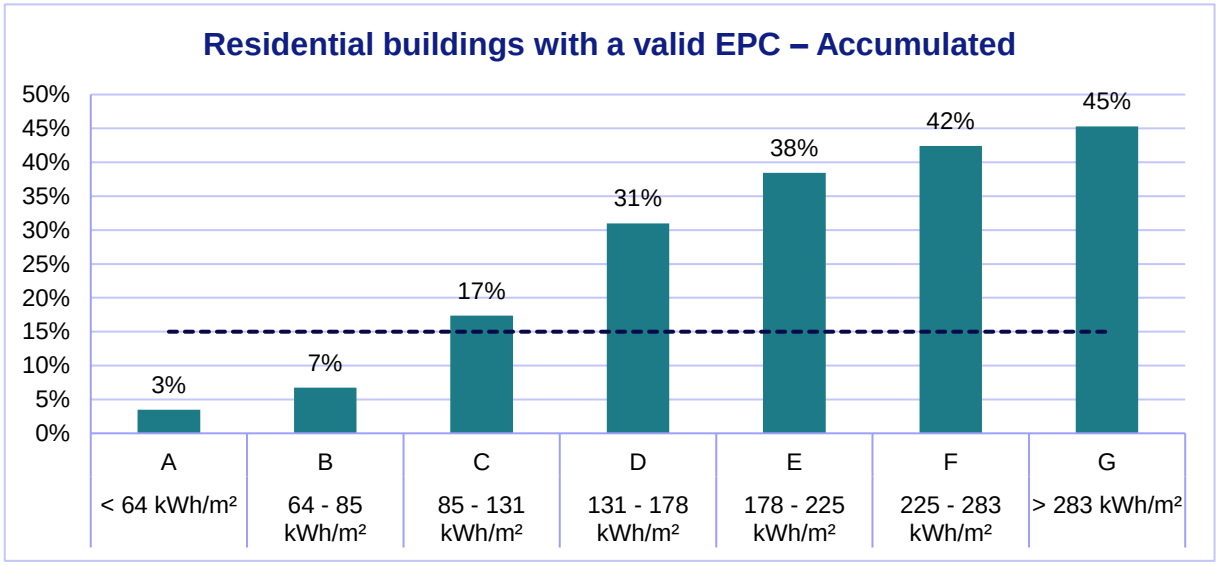


Figure 2. Accumulated distribution of buildings with valid EPCs, the total national residential building stock.

All buildings with an EPC ranking of C or better lie beneath the 17% threshold, when ranked according to the EPCs. However, more than 55% of the national residential building stock is missing in this analysis due to the buildings not having a valid EPC. Therefore, another indicator is needed to evaluate the energy consumption of buildings without a valid EPC.

Figure 3 displays the distribution of EPC according to the year of construction. There is a strong correlation between the year of construction and the EPC ranking in the years from 1950 and onwards. This corresponds well with the expectations, since the political focus on energy consumption has increased significantly throughout the last decades, which has resulted in more regulatory restrictions on energy consumption when designing and constructing new buildings.

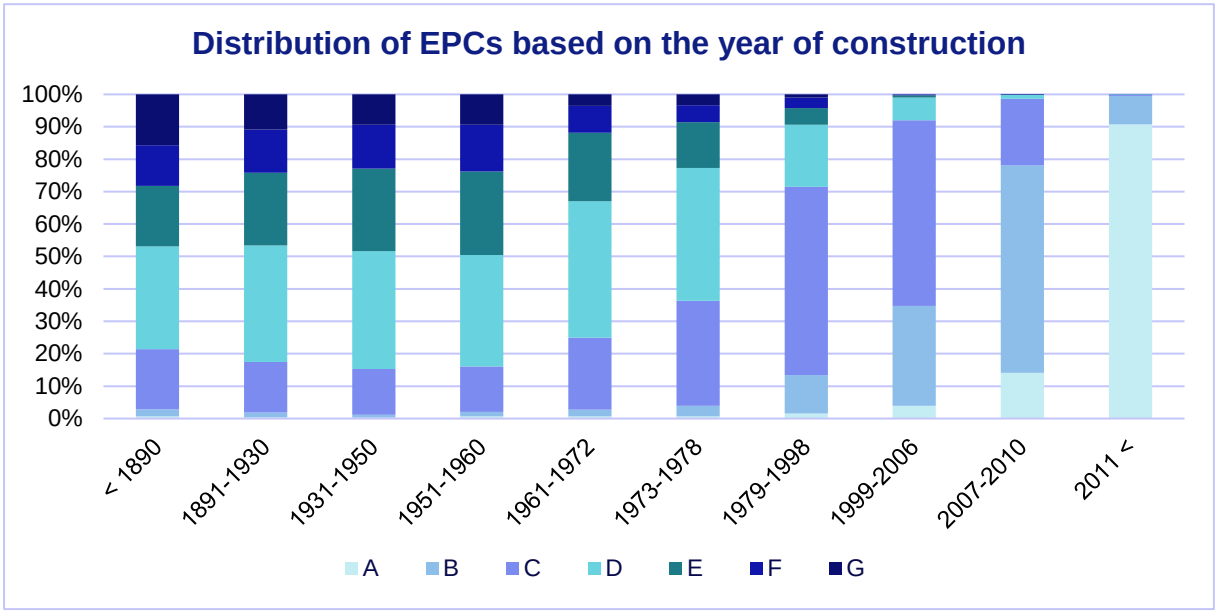


Figure 3. Distribution of EPCs for residential buildings based on the year of construction. (The Danish Energy Agency, 2022)

Figure 4 shows the total national residential building stock in Denmark sorted by year of construction. The EPC ranking categories A and B have been subtracted from each time interval and are shown with a pillar each. Thus, as an example, the pillar “1995-1999” indicates how much building area has been constructed in this timespan and is either categorized C or worse or has no valid EPC.

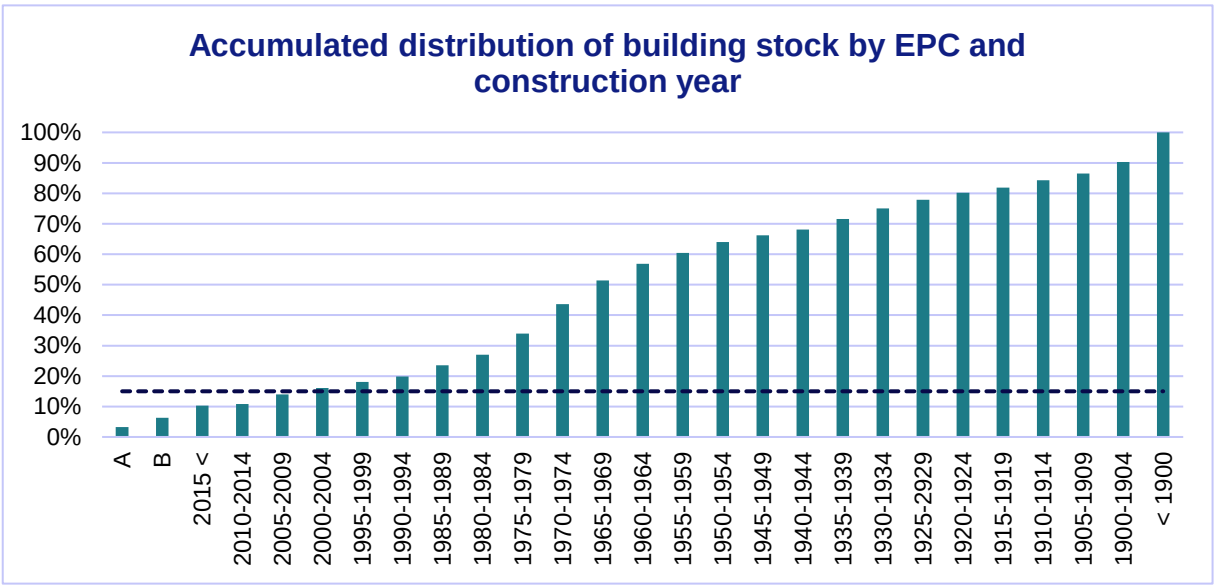


Figure 4. Accumulated share of the total national residential building stock in Denmark based on EPC and year of construction.

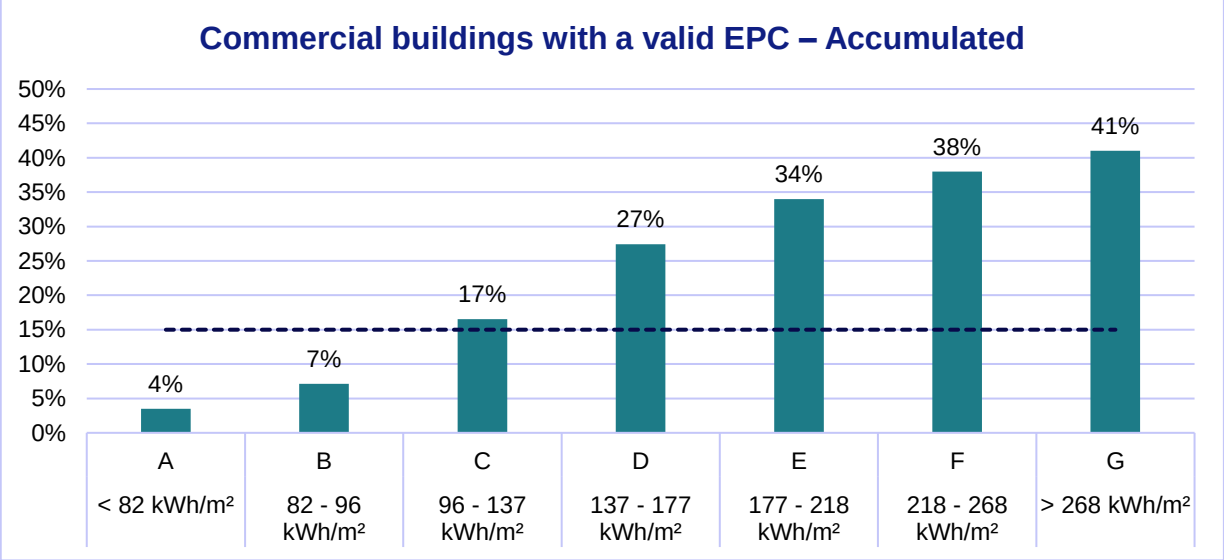
As the figure shows, all buildings ranked with an EPC of A or B lie beneath the 15% threshold of the national residential building stock in Denmark. If the building has no valid EPC at all, but was constructed later than 2009, it will also be within the top 15%. This is conservatively set, since the analysis is based on multiple assumptions.

Commercial buildings

The buildings included in this category are offices and retail buildings.

Similarly, as for residential buildings, it is initially determined how large a share of the total commercial building stock has a valid EPC in Figure 5. As for residential buildings, buildings with an EPC ranking of A or B will be within the top 15% of the most energy-efficient commercial buildings. The energy limits for each category have been added to the figure, corresponding to a commercial building with a floor area of 150 sqm.

Figure 5. Accumulated distribution of buildings with valid EPCs, the total national commercial building stock.



As for residential buildings, all buildings with an EPC ranking of C or better lie beneath the 17% threshold, when ranked according to the EPCs. However, more than 55% of the national commercial building stock is missing in this analysis due to the buildings not having a valid EPC. Therefore, the year of construction is used again to rank the buildings.

Similarly, as for residential buildings, Figure 6 displays the distribution of EPCs according to the year of construction. Also, as for commercial buildings, there is a strong correlation between the year of construction and the EPC ranking in the years from 1980 and onwards.

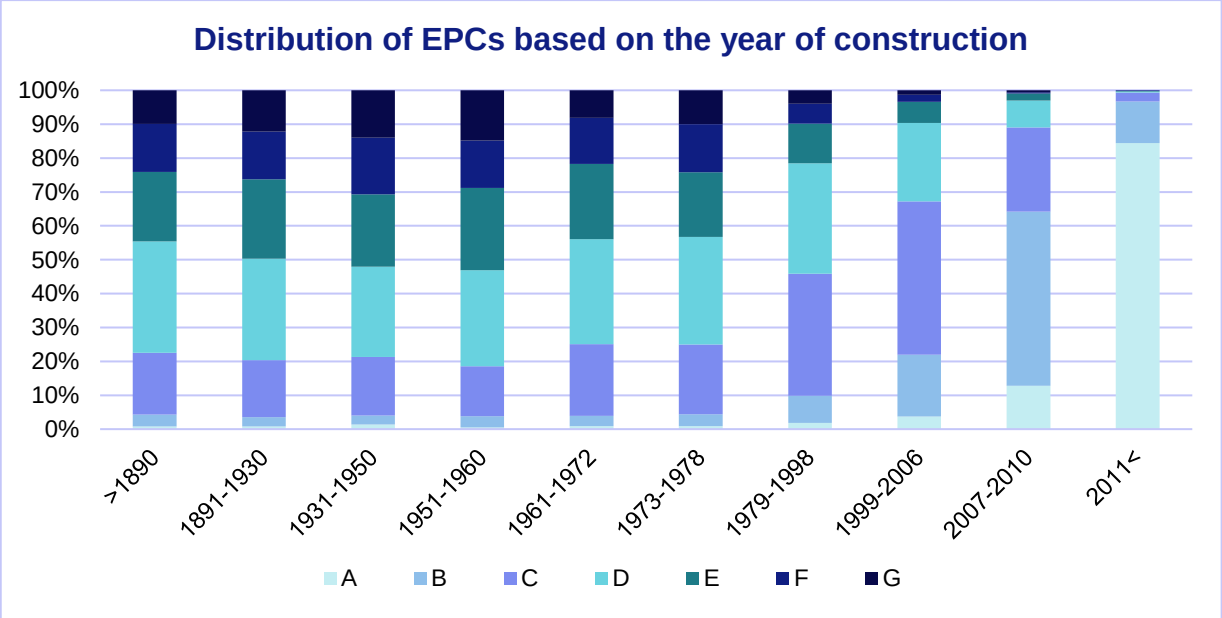


Figure 6. Distribution of EPCs for commercial buildings based on year of construction. (The Danish Energy Agency, 2022)

Figure 7 shows the total national commercial building stock in Denmark sorted by year of construction. The EPC ranking categories A and B have been subtracted from each time interval and are shown with a pillar each, as for residential buildings.

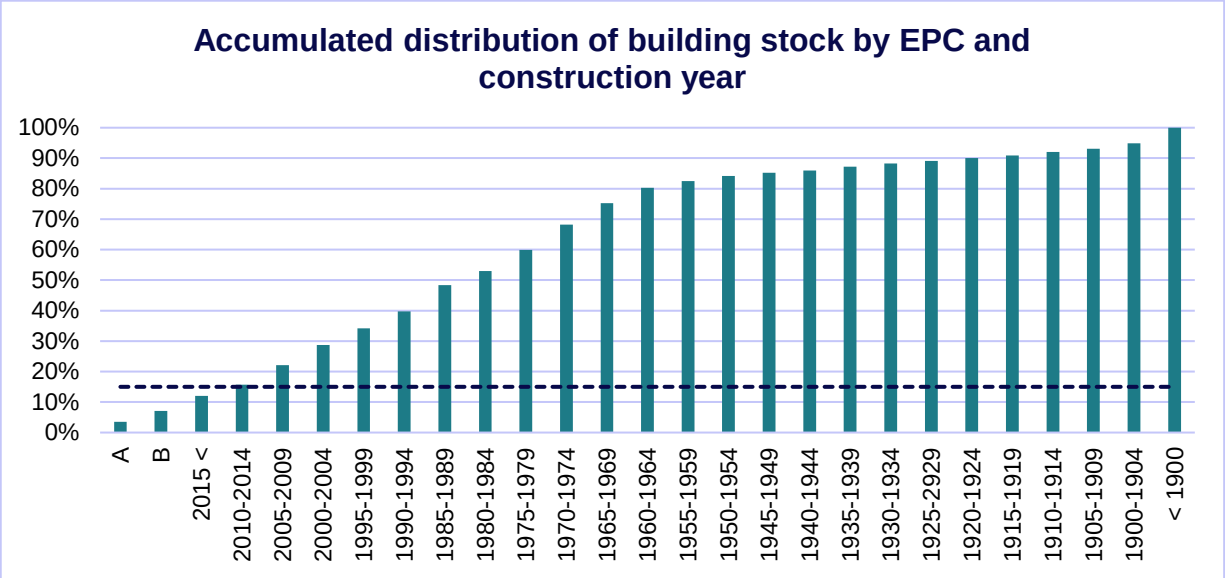


Figure 7. Accumulated share of the total national commercial building stock in Denmark based on EPC and year of construction.

As the figure shows, all buildings ranked with an EPC of A or B lays within the top 15% of the total national commercial building stock in Denmark. If the building has no valid EPC at all, but is constructed later than 2009, it will also be within the top 15%.

Conclusion

Buildings with an EPC ranking of A or B will qualify for the top 15% of both residential and commercial buildings. Residential and commercial buildings with no valid EPC built after 2009 will also rank within top 15%.

Being within top 15% means that these buildings can meet the technical screening criteria for the environmental objective “climate change migration” as defined in the Climate Delegated Act supplementing the EU Taxonomy Regulation.

References

Statistics Denmark. (19 April 2022). *The Bank of Statistics*. Obtained from https://www.statistikbanken.dk/bygb34

The Danish Energy Agency. (19 April 2022). *SparEnergi.dk*. Obtained from Find statistics on the EPCs of buildings: https://sparenergi.dk/forbruger/vaerktoejer/find-statistik-paa-danmarks-energimaeker