Report

Green Buildings Portfolio – Impact Assessment

CLIENT

Askim & Spydeberg Sparebank

SUBJECT

Portfolio of Norwegian Green Residential Buildings

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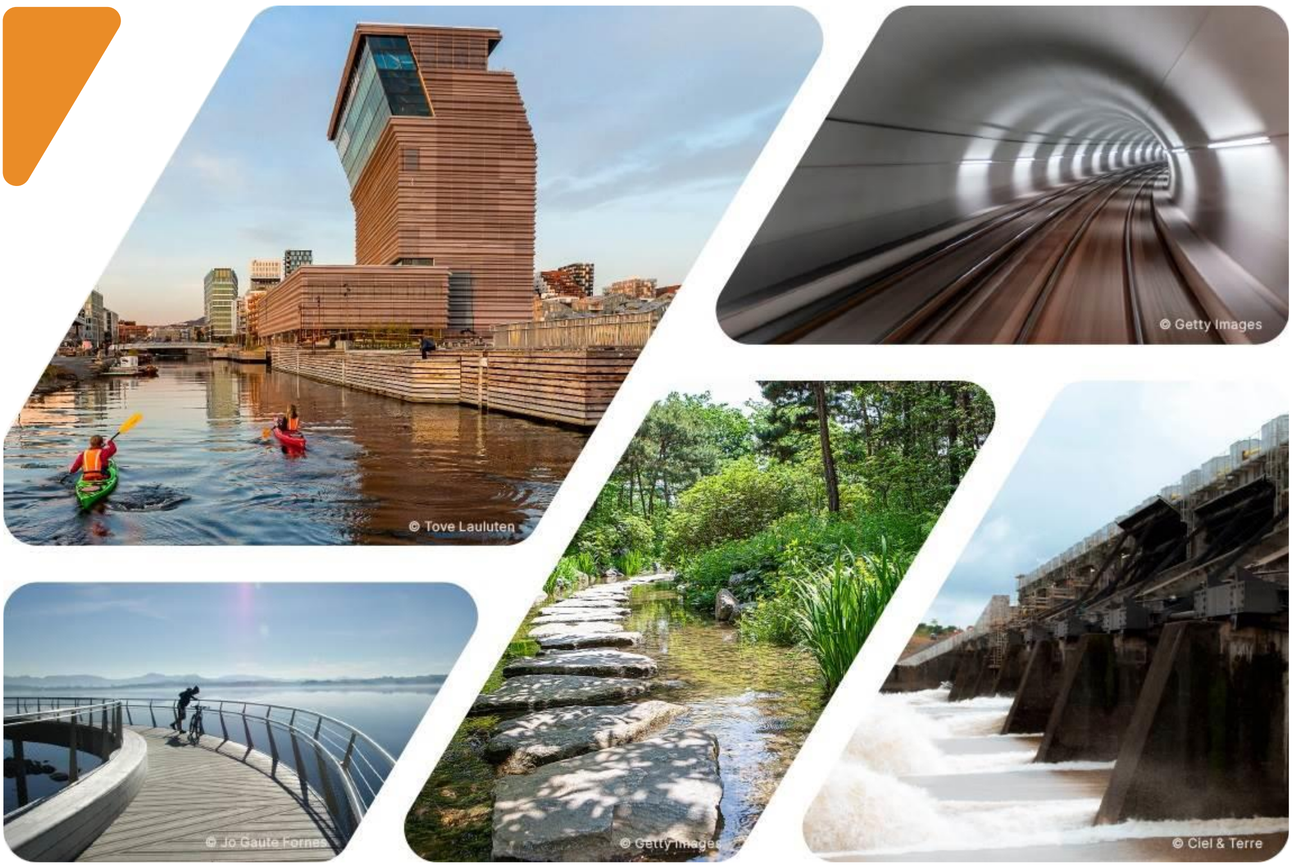

Multiconsult

Report

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1 Introduction

On assignment from Askim & Spydeberg Sparebank, Multiconsult has assessed the Askim & Spydeberg residential building loan portfolio and identified the share eligible for green bonds according to Askim & Spydeberg Sparebank's Green Bond Framework[1]. In this document we briefly describe the bank's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio.

2 Green Residential Buildings Eligibility Criteria

According to Askim & Spydeberg's Green Bond Framework, residential buildings in their portfolio must meet one or more of the following eligibility criteria:

1. Buildings built in 2021 or later: Primary energy demand (PED) is 10% lower than the threshold set for the nearly zero energy building (NZEB) requirements in national measures
2. Buildings built before 2021:
   - Energy Performance Certificate A
   - Buildings within the top 15 percent of the national stock in terms of primary energy demand, defined as buildings built according to Norwegian building codes of 2010 (TEK10) or 2017 (TEK17).
   - Buildings built prior to 2012 must obtain an Energy Performance Certificate B or better.
3. Renovated buildings:
   - Major renovations leading to a reduction in primary energy demand of at least 30 percent. For the full building to qualify after renovation, it should be expected to meet the criteria under #1 or #2 above.

Since full buildings are expected to meet the criteria under #1 or #2 after renovations, criterion #3 has not been applied.

The following sections explain Multiconsult's approach for identifying eligible buildings according to the criteria. The methodology to calculate the energy savings and corresponding avoided emissions for these buildings, compared to the average energy usage of residential buildings in Norway, is also described.

2.1 Criterion 1 for New Residential Buildings: NZEB-10 Percent

2.1.1 The National Definition of Nearly Zero-Energy Buildings of January 2023

The EU Taxonomy for sustainable activities distinguishes between new and existing buildings, with criteria dependent on whether the buildings are completed before or after 31 December 2020. The technical screening criteria for new buildings requires the buildings to have an energy performance, described in terms of primary energy demand, at least 10 percent lower than the threshold set in the national definition of a nearly zero-energy building (NZEB). The energy performance is to be documented by an Energy Performance Certificate (EPC). [1]

[1] https://www.asbank.no/om-oss/annet/samfunnsansvar/rapporter

Multiconsult has assessed the performance of new buildings and how the most energy efficient buildings may be identified in the bank's loan portfolio based the Norwegian NZEB definition. As the building code and the national EPCs are key factors for understanding the NZEB definition and thus efficiently identifying buildings complying to a new build criterion for green buildings, some background information on these and how the Norwegian residential building stock performs today is included below.

The Norwegian national definition of NZEB was published in January 2023 with a correction issued in January 2024. [2, 3] The NZEB definition has clear references to the building code TEK17, and in practical terms, the definition is no stricter than TEK17. The difference lies in:

a. a shift of system boundary to primary energy demand based on calculated net delivered energy and the introduction of primary energy factors, and

b. an exclusion of energy demand related to lighting and technical equipment. The definition states that for calculations of primary energy demand in relation to the Energy Performance of Building Directive and the EU Taxonomy, a factor of 1.0 must be used for all energy carriers.

Table 2-1 shows the NZEB thresholds for residential buildings with specific primary energy demand as presented in the published guidance paper. It is to be noted that the threshold for small residential buildings is influenced by the heated utility area of the building by a factor (1600/heated utility area), and that the threshold for apartment buildings is for the building as a whole and not for individual apartments (as previously in the EPC System).

Table 2-1 Thresholds for NZEB specific primary energy demand. Source: [2, 3]

Building category	Specific primary energy demand for NZEB [kWh/m^2]
Small residential buildings	(76 + 1,600/A)
Apartment buildings	67

The thresholds in the table indicate the building's primary energy demand and are based on calculated net delivered energy according to the Norwegian Standard NS 3031:2014, multiplied with a primary energy factor of 1.0 for all energy carriers. [4] In practical terms, this means that calculated primary energy demand equals calculated net delivered energy.

For residential buildings, the specific primary energy demand thresholds are related to, but not directly comparable to, the EPC calculations since energy demand for lighting and technical equipment is excluded in the NZEB definition. However, this demand is a fixed value in the EPC calculations for residential buildings and can be added or subtracted in conversions between the two systems.

Since parts of the primary energy demand are excluded from the NZEB definition, a 10 percent improvement is smaller in absolute terms than it would be if all consumption were included in the definition. As energy demand related to lighting and technical equipment for residential buildings is fixed, the improvement can only come from efficiency measures related to the remaining energy demand.

2.1.2 Identifying the Buildings with Performance at NZEB-10 Percent or Better

Documentation by NZEB Definition Referenced Standard

One way to document an NZEB-10 percent energy performance, is to present results from calculation in accordance with NS 3031:2014. These calculations are required for all new buildings and are a central part of the required documentation to get a building permit and certification of completion. This documentation is however not easily available. Hence, a more accessible, and probably a more practical approach for identifying qualifying objects in a bank's portfolio, is to use energy labels.

Documentation by EPC Data

The Norwegian EPC System became operative in 2010 and was made mandatory for all new residences completed after the 1st of July 2010, as well as for all residences sold or rented out. By retrieving sufficient data from the EPC database and combining it with data on the residences' heated utility area, NZEB-10 percent eligible objects in a bank's portfolio can be identified. Where reliable area data is not available to the bank, the national average in the building statistics may be used. This is also more in line with documentation requirements in the EU Taxonomy Annex 1.

The Norwegian EPC system is not yet using primary energy, but this might be included in an upcoming revision of the EPC system. Since the information accompanying the NZEB definition set national primary energy factors to 1 (one) flat for all energy carriers, it is a fair assumption that specific net delivered energy in the EPC system is equal to specific primary energy demand in the NZEB definition.

The energy rating (A to G) in the EPC system provides an overall assessment of the building's energy needs, specifically the number of kilowatt-hours the building or residence is calculated to require per square meter for standardized (normal) use in a standardized climate. The energy rating is based on a calculation of net delivered energy according to the Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings - Method and data*, including the efficiencies of the building's energy system (power, heat pump, district energy, solar energy etc.). Thus, the energy rating is independent of actual measured energy use.

Table 2-2 describes how the EPC thresholds are dependent on the area of the residence. As mentioned, the EPC energy rating is based on a calculation of net delivered energy. The building codes are on the other hand defined by calculated net energy demand, which excludes the building's energy system and requirements independent of dwelling area. Both the building codes and the EPC system consider all standard consumption, including lighting and technical equipment.

Table 2-2 EPC's energy rating thresholds for residential building categories and dependency on building area. Source: [5]

Building category	Calculated specific net delivered energy per m² heated utility area [kWh/m²]						
	A	B	C	D	E	F	G
	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	No limit
Small residential buildings	95	120	145	175	205	250	> F
Sq. m adjustment	+800/A	+1,600/A	+2,500/A	+4,100/A	+5,800/A	+8,000/A	
Apartments	85	95	110	135	160	200	> F
Sq. m adjustment	+600/A	+1,000/A	+1,500/A	+2,200/A	+3,000/A	+4,000/A	

Until recently, the Norwegian EPC regulations stated that apartments must have individual EPCs. This meant that apartments in an apartment building would receive different EPC energy ratings depending on their location in the building in relation to surfaces exposed to the outdoors, etc. The EPC regulation allowed establishing EPCs for apartments based on calculations for the apartment building as one unit only when all apartments were smaller than 50 m². Regardless, the thresholds for apartments in Table 2-2 were still applicable.

However, the EPC regulation was changed on March 1, 2024. It is now possible to create an EPC valid for an entire apartment building, provided it is prepared by a company that meets the competence requirements. This aligns with the method used to evaluate energy requirements in the building code (TEK17) and will therefore be the preferred way to establish EPCs for new apartment buildings from now on. When apartment owners want to sell their apartments and need an EPC, they can choose whether to use an EPC established for the apartment building as a whole or prepare an individual EPC for the apartment. For now, the thresholds for apartments in Table 2-2 are also valid for an apartment building, but there may be changes in the future.

The EPC database administrator, Enova, has recently opened for sharing more detailed information from the database with banks, including calculated specific net delivered energy. This enables translation between the specific energy demand in the NZEB definition and the specific net delivered energy available in the EPC, adding the fixed values for lighting and technical equipment.

In Figure 2-1 the columns show the thresholds in the EPC system for labels A, B and C where area correction is applied for a small residential building with heated area of 166 m^2, a single apartment of 65 m^2 and an apartment building of 2,000 m^2. The lines indicate the calculated NZEB and NZEB-10 percent thresholds calculated by adding the fixed values for lighting and technical equipment. Table 2-3 gives a more granular picture including more dwelling and building sizes.

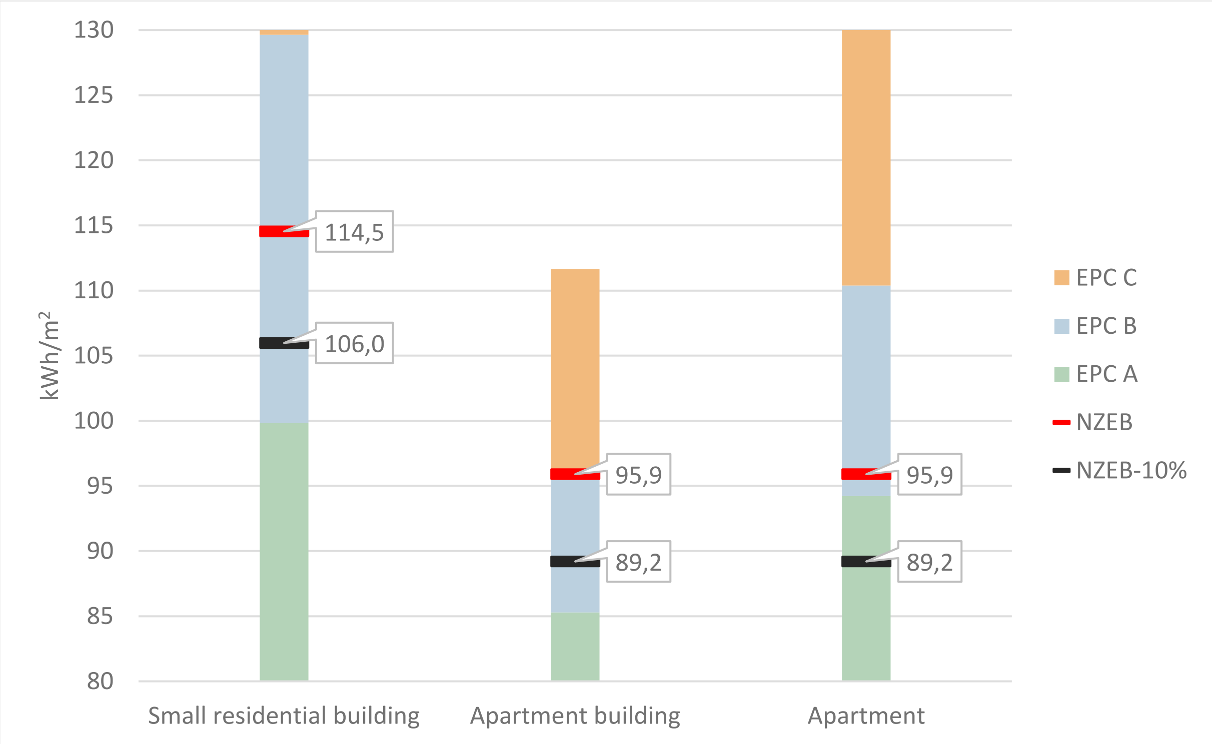


Figure 2-1 Energy performance with reference to the national definition of NZEB and NZEB-10 percent compared to limit values in the EPC system (values dependent on the heated utility area of building/residence). Source: [6, 4, 2]

The thresholds in Figure 2-1 are calculated based on standard values for lighting and technical equipment in NS 3031:2014 and average building areas found in building statistics for 2021. [6, 4] Due to the area correction factor, the thresholds can be calculated individually for all objects in the portfolio based on actual area. For apartments, the NZEB lines in the figure are constant, while the EPC thresholds depend on apartment size. For small residential buildings, both NZEB and EPC thresholds are dependent on the size of the residence. Table 2-3 provides a more granular picture, including a wider range of residence and building sizes.

Table 2-3 Qualifying EPC's dependent on the heated utility area of building/residence.

Limit values specific energy demand [kWh/m²]			
Small residential buildings			
Area unit [m²]	NZEB-10 percent made comparable to EPC	EPC A	EPC B
50	126	111	152
100	112	103	136
150	107	100	131
200	105	99	128
250	103	98	126
300	102	98	125
Apartments (EPC available, but no NZEB definition established at apartment level)			
Area unit [m²]	NZEB-10 percent made comparable to EPC	EPC A	EPC B
50	89	97	115
75	89	93	108
100	89	91	105
125	89	90	103
150	89	89	102
175	89	88	101
Apartment buildings (NZEB definition in place, but no (very few) EPCs at building level)			
Area unit [m²]	NZEB-10 percent made comparable to EPC	EPC A	EPC B
500	89	86	97
2,000	89	85	96
5,000	89	85	95

For small residential buildings, the dwelling size specific NZEB threshold is found by inserting the buildings heated utility floor space area in the area correction factor. Adding the fixed values for lighting and technical equipment, the value is comparable to the specific net delivered energy given in the EPC-system.

A complicating factor for apartments in a bank's portfolio when using the EPC data to identify qualifying objects, is the fact that the NZEB definition, as opposed to the EPC system, does not consider individual apartments.

As previously described, the EPC regulation has recently changed, allowing an EPC to be valid for an entire apartment building. However, all existing EPC energy ratings in the portfolio prior to March 2024 were made according to the previous regulations, where apartments had to have individual EPCs. These EPCs will be around for many years, as the period of validity is 10 years. The EPC limit values reflect individual apartments sharing walls with other heated areas, resulting in lower values compared to whole buildings.

There is an area correction factor in the EPC calculations, but not in the NZEB calculations for apartment buildings. Using the individual apartment area correction factor in the EPC system results in an NZEB threshold, converted to EPC terms, much stricter than for other building categories. The "apartment column" in Figure 2-1 and Table 2-3 illustrates EPC thresholds using an average apartment size of 65 m^2, derived from 2021 building data from Statistics Norway, showing that even EPC A is not always sufficient for qualifying as NZEB-10 percent.

In the future, new apartment buildings will have an EPC established for the whole building, simplifying the conversion between the EPC system and the NZEB definition. This will also make the identification of NZEB-10 percent apartment buildings more accurate, likely resulting in more qualifying objects, as shown in Table 2-3.

2.1.3 Eligibility Small Residential Buildings

Small residential buildings completed since 31 December 2020 with energy label A, or energy label B with specific delivered energy demand below the defined threshold, qualify on the newbuild criterion NZEB-10 percent.

The EPC energy rating A thresholds, as described in specific energy demand in Figure 2-1 and Table 2-3, are below NZEB-10 percent for all small residential buildings, regardless of building size. Hence, an EPC A is sufficient to identify green buildings of this category. As illustrated by the above analysis, qualifying only small residential buildings with an EPC A is a conservative approach, as some buildings with an EPC B would also qualify. The more granular calculated specific net delivered energy available from the EPC system can supplement the straightforward qualifying of EPC A buildings in the green pool with some buildings having an EPC B.

The practical approach utilizing detailed data on the building can be illustrated as in Figure 2-2.

Calculate the building specific NZEB limit value based on the building's heated utility area	
76 + 1,600/A	Example 160 m^2 building: 86 kWh/m^2

↓

NZEB-10 percent	
(76 + 1,600/A) * 0.9	77.4 kWh/m^2

↓

Add technical equipment and lighting	
(76 + 1,600/A) * 0.9 + 28.9	106.3 kWh/m^2

↓

Compare to calculated specific net delivered energy retrieved from the EPC database

Figure 2-2 How to compare NZEB-10 percent to specific energy demand from the EPC system for small residential buildings.

2.1.4 Eligibility Apartment Buildings

Apartment buildings completed since December 31, 2020, with an EPC A, or an EPC B and calculated specific net delivered energy below the defined threshold, qualify for the newbuild criterion NZEB-10 percent.

With an EPC for an apartment building as a whole (option available after March 2024), an EPC A is sufficient to identify and qualify apartment buildings (as illustrated in the last rows of Table 2-3). Some EPC B buildings would also qualify, using the calculated specific net delivered energy available from the EPC system.

The practical approach utilizing detailed data on the building can be illustrated as follows, in Figure 2-3.

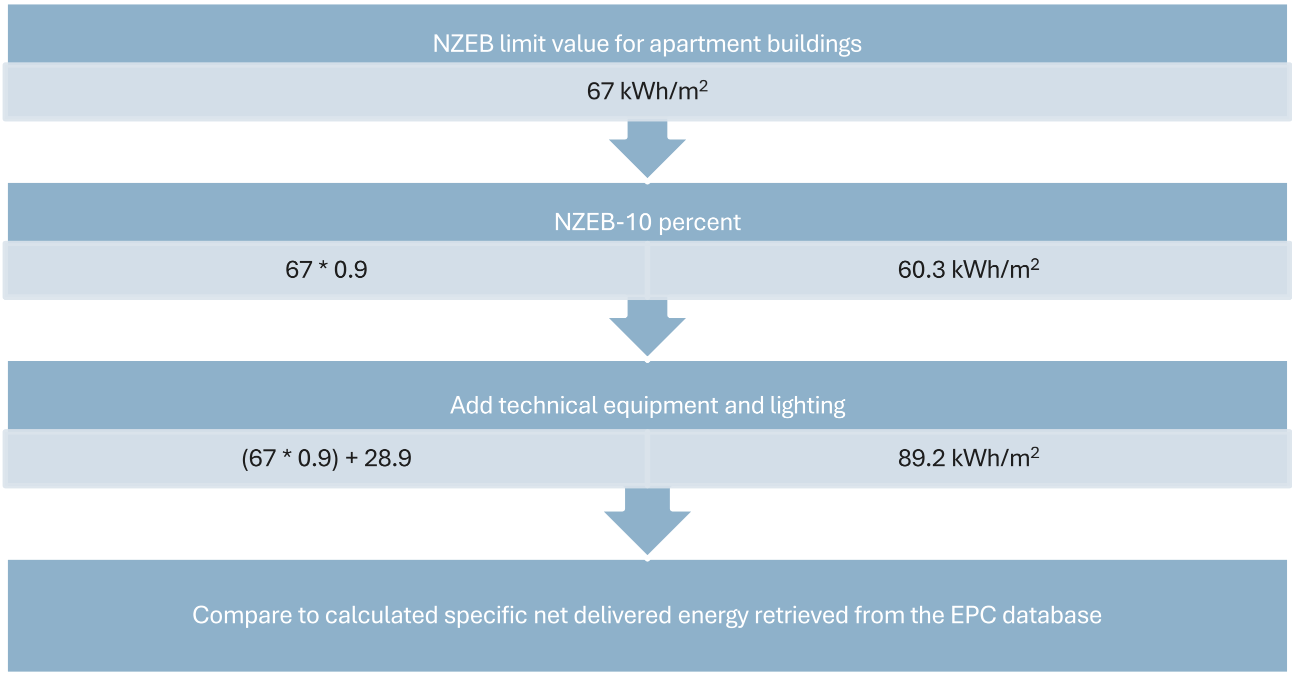


Figure 2-3 How to compare NZEB-10 percent to calculated specific net delivered energy from the EPC system for apartment buildings.

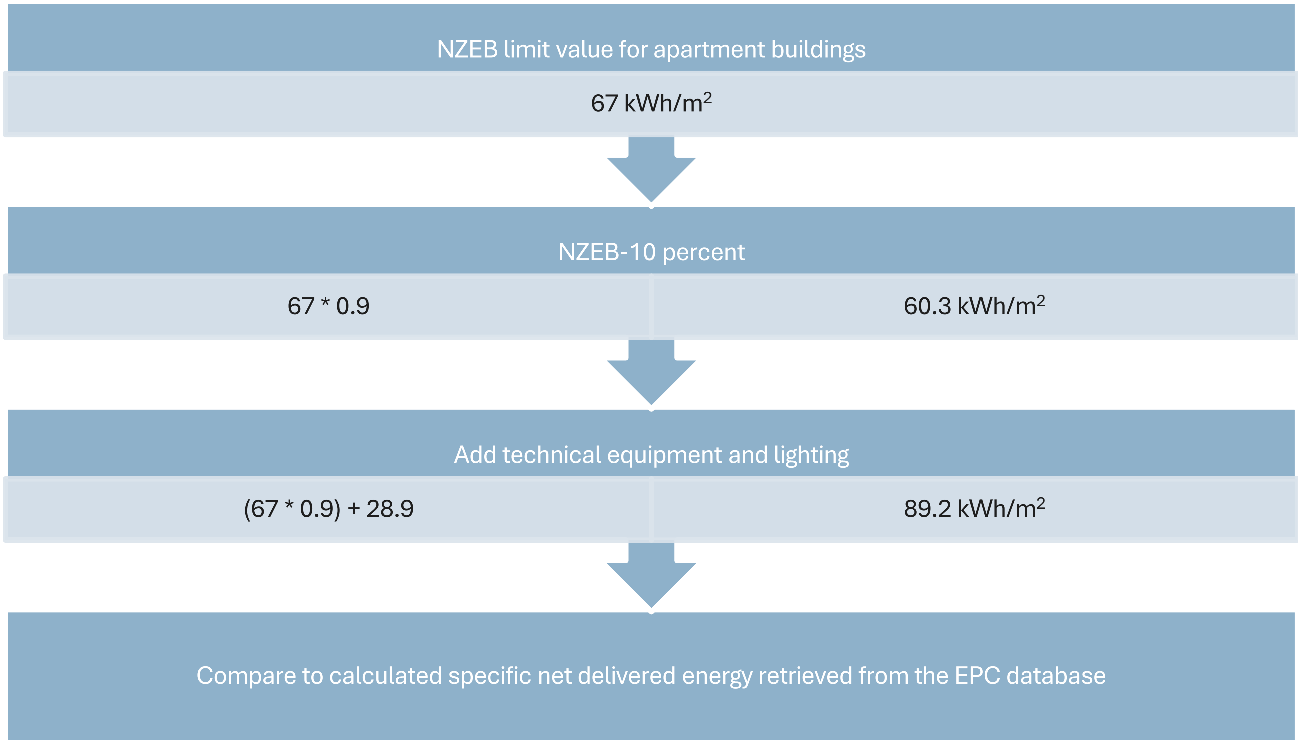
2.1.5 Eligibility Apartments

Apartments completed since December 31, 2020, with calculated specific net delivered energy below the defined threshold, qualify under the newbuild criterion NZEB-10 percent.

As illustrated in Figure 2-4, there are two potential approaches to understanding and comparing the NZEB definition and the EPC data for individual apartments. One approach is to assume that the apartment EPC is valid for the entire apartment building, in which case the area correction factor would be based on the building area as opposed to the apartment area, ultimately making the NZEB thresholds directly convertible to EPC terms (“apartment” column in Figure 2-1). The practical approach utilizing detailed EPC data on the individual apartment, can then be described by Step 1 in Figure 2-4. (Step 1 is the same as for eligible apartment buildings in Figure 2-3). Step 1 is independent of apartment and apartment building size and translates the NZEB-10 percent threshold to a limit value comparable to the calculated specific net delivered energy in the EPC system.

As an alternative, considering that calculated specific net delivered energy for an average apartment is equal to or higher than that for an apartment building as a whole, Step 2 in Figure 2-4 can be applied in addition to Step 1. This requires information on the EPC energy rating, apartment area, and apartment building area. Here in Step 2, it is illustrated by an apartment of 65 m^2 just qualifying for an EPC A, placed in a 2,000 m^2 building. The implications of an area correction factor diminish for large buildings, as illustrated in Table 2-3, hence opening the possibility of using average values from national statistics instead of precise area data. Apartment area is available in the EPC database.

STEP 1



STEP 2

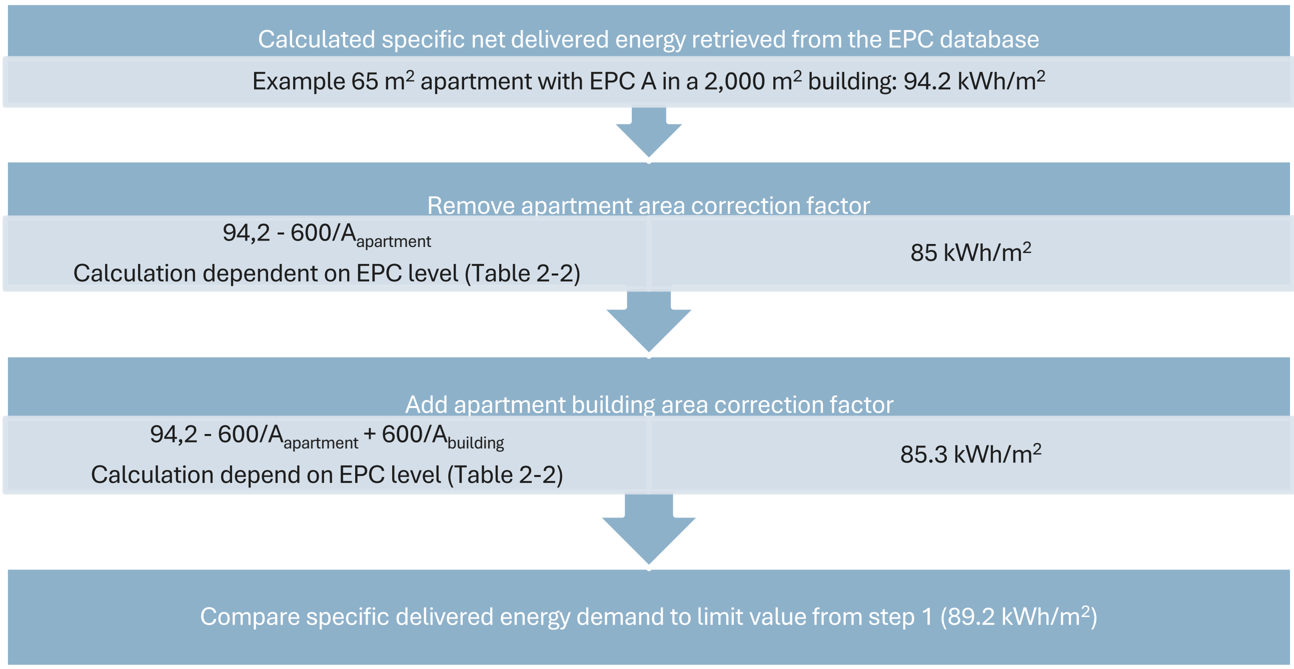


Figure 2-4 How to compare NZEB-10 percent to specific energy demand from the EPC system for individual apartments.

The Step 2 calculation shows that the area correction factor $600/A_{building}$ would need to exceed 4.2 for an EPC A-rated apartment to *not* qualify as a green building. This value (4.2) represents the gap between the NZEB-10 percent threshold and the EPC A threshold (89.2 - 85). For the factor to be this high, the total apartment building's area would need to be less than approx. 143 m^2 - a size well below typical apartment buildings in Norway. Therefore, all apartments with an EPC A rating can be considered green buildings in this category.

2.2 Criterion 2 for Residential Buildings: Top 15 percent

According to the Askim & Spydeberg Green Framework, residential buildings built before 2021 with EPC A label or within the top 15 percent low carbon buildings in Norway are eligible. The top 15 percent most energy efficient buildings in the Norwegian building stock, and thus the eligible parts of the Askim & Spydeberg portfolio, can be identified based on building codes and EPCs.

2.2.1 Building codes

Changes in the Norwegian building code have over several decades consistently resulted in more energy efficient buildings. This means newer buildings have a lower energy usage than older buildings. Figure 2-5 illustrates net energy demand calculated for model buildings equivalent to those used in each building code definitions. From TEK07 to TEK17 the reduction was about 15 percent and the former shift from TEK97 to TEK07 was no less than 25 percent. Note that, for residential buildings, there was no change between TEK07 and TEK10 with respect to energy efficiency requirements.

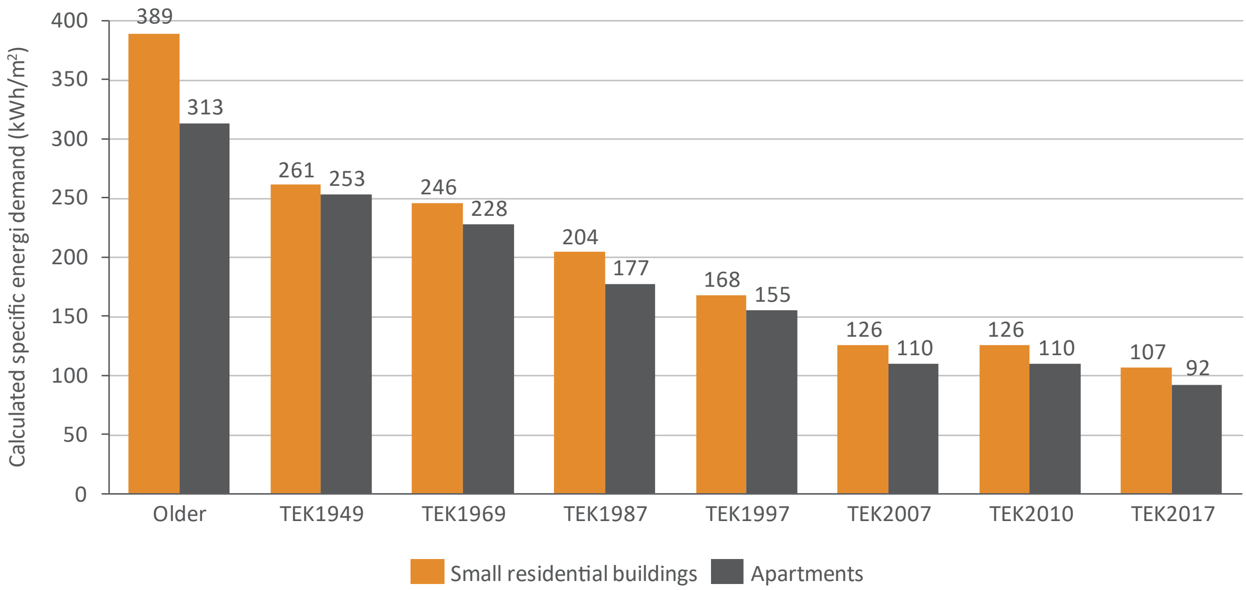


Figure 2-5 Development in calculated specific net energy demand based on building code and building tradition. Source: Multiconsult, SIMIEN simulations

Figure 2-6 shows how the Norwegian residential building stock is distributed by age. The figure shows how buildings finished in 2012 and later (and built according to TEK10 and TEK17) amount to 13.3 percent of the total stock.

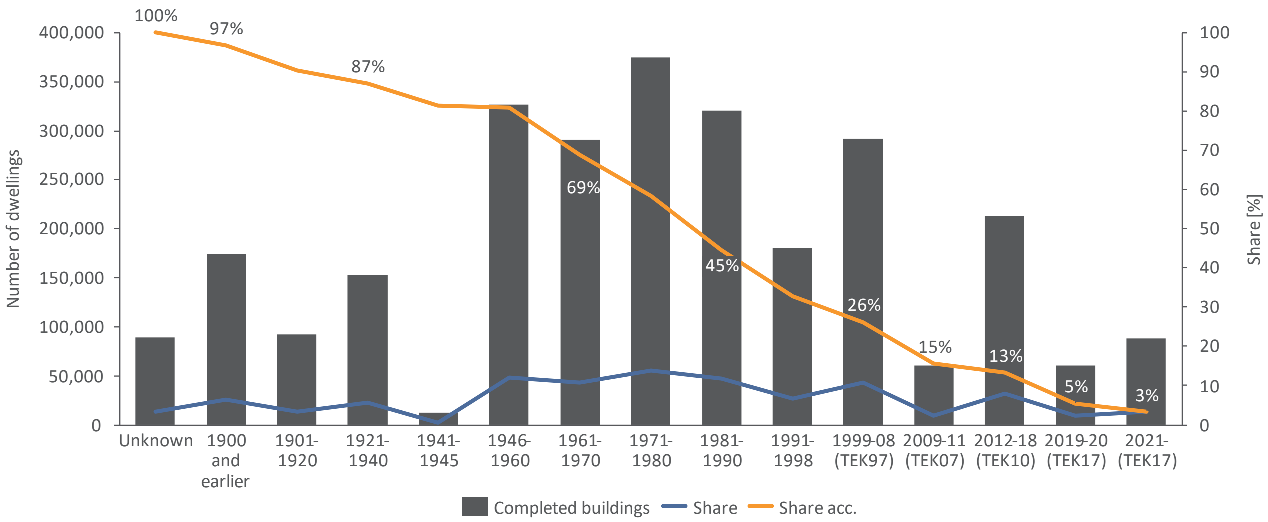


Figure 2-6 Age and building code distribution of dwellings. Source: [6], Multiconsult

Based on theoretical energy demand in the building stock, the same 13.3 percent of the stock makes up only five percent of the energy demand in residential buildings and just under five percent of the related CO2 emissions, as indicated in Figure 2-7 and Figure 2-8, respectively. The difference between energy demand and CO2 emissions are due to the less CO2 intensive heating solutions in newer buildings. It must be noted that these calculations are based on the European power production mix that reflects an average in the buildings lifetime, assuming a decarbonisation in the European energy system as presented in the next section, section 0.

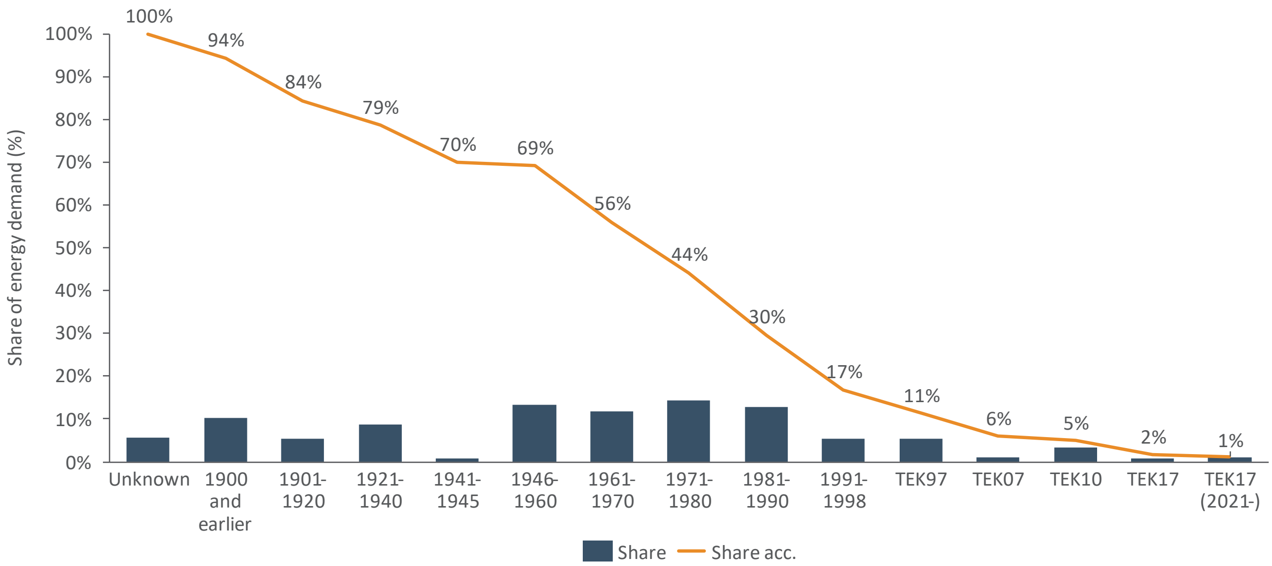


Figure 2-7 The building stock's relative share of energy demand dependent on building year and code. Source: [6], Multiconsult

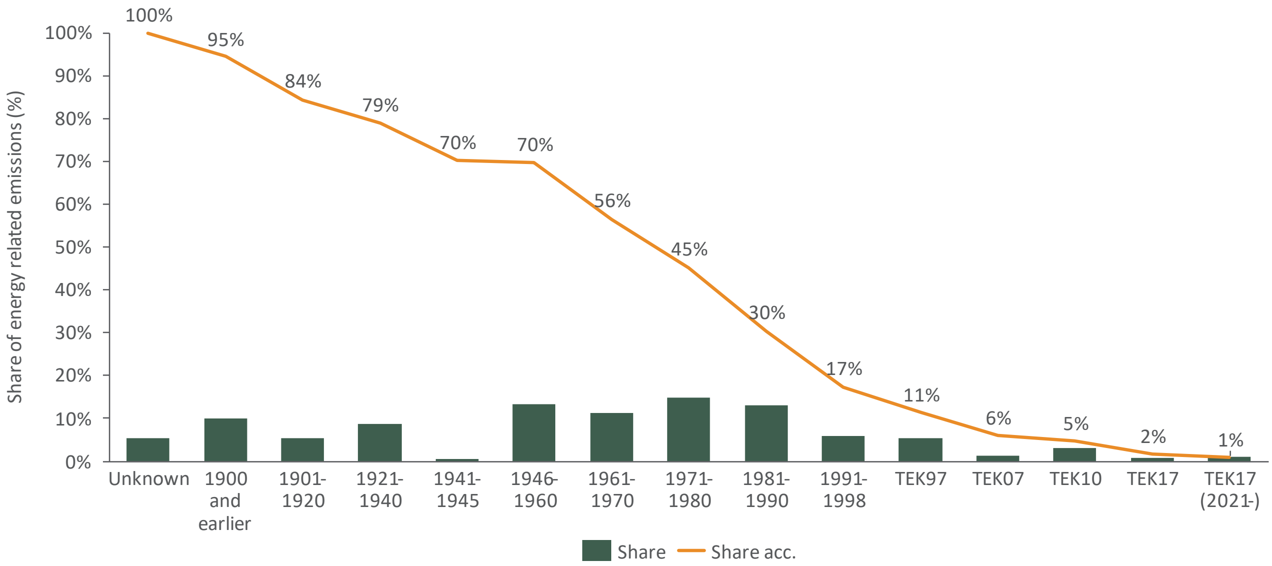


Figure 2-8 The building stock's relative share of CO2 emissions related to energy demand dependent on building year and code. Calculation based on European power production mix in asset lifetime (see section 0). Source: [6], [7], Multiconsult

Eligibility based on building codes

The above building stock data indicate that 13.3 percent of the current residential buildings in Norway were constructed using the code of 2010 (TEK10) and later codes.

Combining the information on the calculated energy demand related to building code in Figure 2-5 and information on the residential building stock in Figure 2-6, the calculated average specific energy demand of the residential Norwegian buildings, weighted for actual stock, is 202 kWh/m^2 for apartments and 257 kWh/m^2 for small residential buildings. The corresponding energy demand for eligible buildings (TEK10 and TEK17) is 102 kWh/m^2 for apartments and 119 kWh/m^2 for small residential buildings.

Hence, compared to the average residential building stock, building codes TEK10 and TEK17 give a calculated specific energy demand reduction of 50 percent for apartments and 54 percent for small residential buildings. This difference is later used in calculations of avoided energy usage and emissions.

New or existing Norwegian residential buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes are thus eligible for green bonds as all these buildings have significantly better energy standards and account for less than 15 percent of the residential building stock. A two-year lag between implementation of a new building code and the buildings built under that code has been accounted for[2].

2.2.2 Energy Performance Certificates

Residential buildings with EPC A are automatically eligible based on the framework. For information about the Norwegian EPC system, see section 2.1.2. The energy label in the EPC system is based on calculated delivered energy, including the efficiencies of the building's energy system, while the

[2] TEK10 was implemented in July 2010, however since the energy requirements were unchanged from TEK07 to TEK10 it is a very robust assumption that all buildings finished in 2012 or later have used energy requirements according to TEK10.

building codes are defined by net calculated energy, not including the building's energy system. The criteria are hence based on two different system boundaries and must be regarded as two separate criteria describing and classifying the buildings level energy efficiency differently.

The grade C was defined in 2010 so that a building under the building codes of TEK07 in most cases should get an EPC C. Residences built after the building code of 2007 will hence mostly get a C or better.

The EPC coverage is not equally distributed over the building stock. There is currently a coverage ratio of EPC labels relative to the total building stock of about 50 percent. Figure 2-9 shows the age of the buildings with EPCs and the total number of buildings in the building stock, and how much of the building stock is represented in the EPC database. This illustrates how younger buildings are overrepresented in the EPC database. Note that EPC data is regularly updated and the data behind the figure includes new registrations in 2024. Building stock data are however, only updated on a yearly basis and Figure 2-9 only includes buildings finished before the end of 2023. [8]

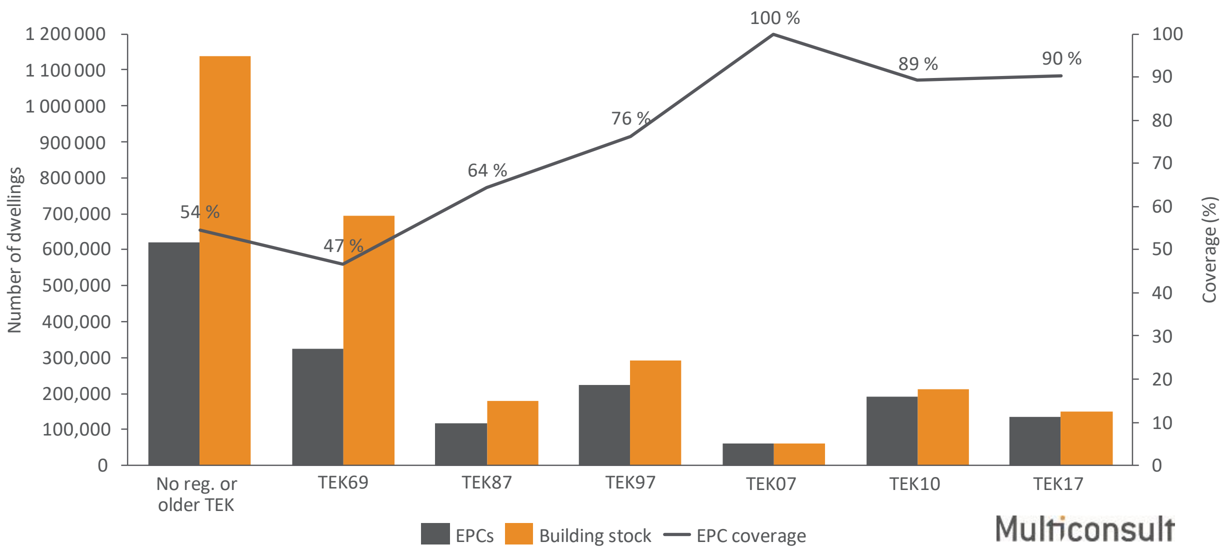


Figure 2-9 Age distribution in EPCs vs. actual residential building stock and EPC coverage by building year. Source: [8] [9] [10]

Assuming registered EPCs are representative for the building stock completed in the period a certain building code is applied; it is possible to indicate what the label distribution would be if all residential buildings were given a certificate. Figure 2-10 illustrates how EPCs would be distributed based on this assumption. 9.3 percent of the residences would have a B or better.

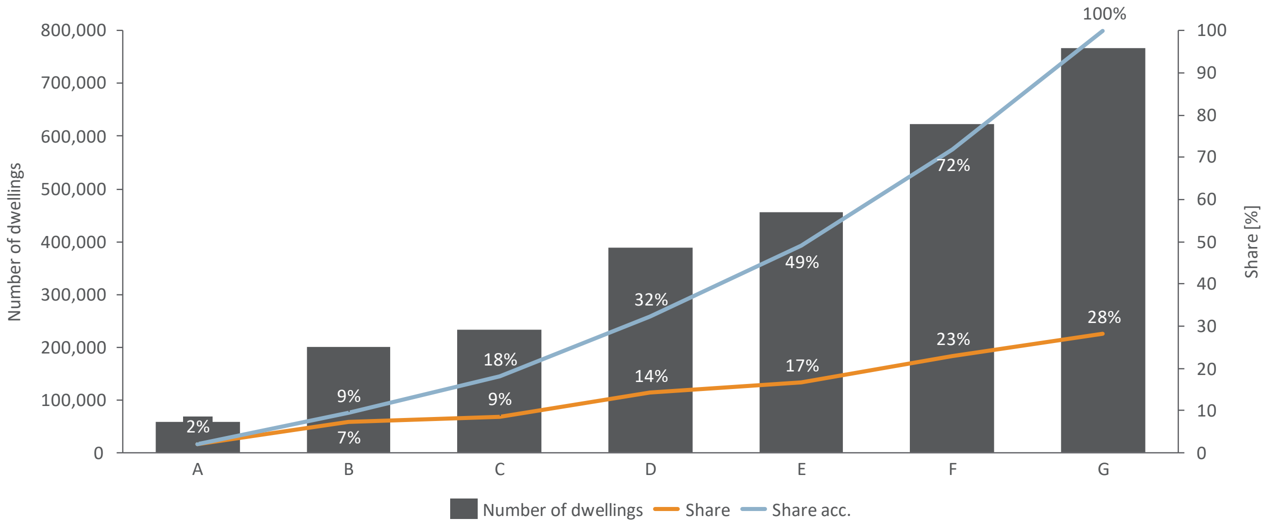


Figure 2-10 EPCs extrapolated to include the whole residential building stock. Source: [8] [9] [10]

Eligibility based on EPCs

An EPC is mandatory for new buildings and existing residential buildings that are sold or rented. The EPC data indicates that 18 percent of the current residential buildings in Norway will have a C or better, and 9.3 percent will have an A or B.

2.2.3 Combination of building codes and EPCs

The two described criteria are based on different statistics. It is, however, interesting to view them in combination. *Table 2-4* illustrates how the criteria, independently and in combination, make up cumulative percentages of the total residential building stock in Norway.

Interpretation: TEK10 and newer in isolation represents 13.3 percent; TEK10 and newer in combination with A+B labels represents 14.8 percent; TEK10 and newer in combination with A+B+C labels represents 19.2 percent of the total Norwegian residential building stock.

Table 2-4 Matrix of Cumulative percentages for criteria combinations (FY23), relative to the total residential building stock in Norway.

	TEK10+TEK17	EPC A+B	EPC A+B+C
TEK10+TEK17	13.3 percent	14.8 percent	19.2 percent
EPC A+B		9.3 percent	
EPC A+B+C			16.8 percent

Based on this, residential buildings with EPC A, built under TEK10 and TEK17 or with EPC B are within the top 15 percent most energy efficient residential buildings in Norway.

3 Emission Factor for Impact Assessment

This section outlines the emission factor used in the assessment of the green bond eligible part of Askim & Spydebergs's residential portfolio.

The CO2 emissions resulting from in use energy demand in residential buildings depend to a large degree on the age of the building. This is due to two factors: the differences in energy efficiency requirements in the building code, and development in the predominant solutions and energy sources for heating in new buildings. Examples of the latter are direct electric heating, several types of heat pumps, bioenergy, and district heating. The share of fossil fuel is very low and declining.

Since the Norwegian buildings are predominantly heated by electricity, the placement of the system boundary for power production heavily influences the emission factor for the energy demand of Norwegian buildings. Since the eligible objects in the portfolio are rather new, and expected to have a 60-year life, the impact is considered best illustrated by the yearly average CO2 emissions over their lifetime. The emission factor applied in this green portfolio impact assessment reflects a projected lifetime average, assuming a decarbonisation of the European energy system.

Using a life-cycle analysis (LCA), the Norwegian Standard NS 3720:2018 [7] considers international trade of electricity and the fact that consumption and grid emission factors do not necessarily mirror domestic production. The resulting grid emission factor, as average in the lifetime of an asset, is based on a linear trajectory from the current grid emission factor to a close to zero emission factor in 2050 and steady until the end of the lifetime with a European (EU27+ UK+ Norway) system boundary. The factor is location-based. The resulting grid emission factor is 136 gCO2-eq/kWh, summarized in Table 3-1. [7]

Table 3-1 Electricity production emission factor (CO2-eq) without and with influx of other heating sources for buildings. Source: [7]

Scenario	Description	Emission factor electricity [gCO2-eq/kWh]	Emission factor considering other heating sources[3] [gCO2-eq/kWh]
European (EU27+ UK+ Norway) NS 3720:2018 electricity mix	Location-based electricity mix with wide system boundary including EU countries, UK and Norway, average emissions over building's 60-year lifetime	136	115

The standard also calculates the equivalent Norway only emission factor. Norway is part of a larger, integrated European power grid. Electricity imports and exports throughout the year means that some electricity consumed in Norway is produced abroad. Using the European mix instead of the Norway only mix, is then a more conservative approach.

To calculate the impact on climate gas emissions, the emission factor is applied to all electricity consumption in Norwegian residential buildings. Electricity is, as mentioned, the dominant energy carrier to Norwegian residential buildings, but the energy mix also includes other energy carriers such as bio energy and district heating. The influx of other energy sources for heating purposes is applied to all electricity emission factors resulting in the "Emission factor considering other heating sources", found in the rightmost column in Table 3-1.

[3] Calculated by Multiconsult, based on building code assignments for the Norwegian Building Authority (DiBK).

4 Green Portfolio Analysis and Impact Assessment

The residential building green loan portfolio of Askim & Spydeberg Sparebank consists of residential buildings that meet the criteria as formulated in section 2.

4.1 Eligible Buildings

The 458 eligible buildings in Askim & Spydeberg Sparebank's portfolio as of January 3rd, 2025, are estimated to amount to 67,515 square meters. The portfolio data set provided by the bank contains area, EPC energy rating and estimated energy demand for most objects. Where data available from the bank does not include reliable area per object, area per residence is calculated based on average area derived from national statistics. [6] No assumptions has been made to replace missing energy ratings.

Table 4-1 Number of eligible individual residences in the portfolio and estimated total building areas.

Criterion	Type of building	Number of objects	Area total [m^2]
Criterion 1, NZEB-10 percent	Small residential buildings	48	10,770
	Apartments	20	1,380
Criterion 2, Top 15 percent	Small residential buildings	239	43,443
	Apartments	151	11,922
Total criterion 1 and 2		458	67,515

Objects in the portfolio built in 2021 or later are matched against the NZEB-10 percent criterion. Objects built before this year, are first qualified based on EPC A, then on building codes TEK10 and TEK17. Finally, objects are qualified based on EPC B. There is no double-counting of objects that qualify under more than one criterion.

4.2 Avoided Emissions

For each eligible object, impact is calculated by finding the reduction in energy demand and related emissions compared to the baseline of an average building from the entire building stock. The reduction in energy demand is then multiplied with the area of the eligible asset and the emission factors from Table 3-1, and summed up for all the units. A proportional relationship is expected between energy consumption and emissions in impact calculations.

For buildings qualifying under the NZEB-10 percent criterion, the reduction is calculated by taking the difference between the calculated specific energy usage of each unit and the NZEB threshold for a corresponding NZEB unit of the same area and building type.

The baseline for the top 15 percent criterion is the calculated average specific energy demand of the residential Norwegian building stock, which, separated on apartments and small residential buildings, is 202 kWh/m^2 and 257 kWh/m^2, respectively. As only half of all Norwegian dwellings have a registered EPC, these average specific energy demands of the Norwegian residential building stock are used as baseline for the buildings qualifying according to the EPC criterion.

For the existing buildings eligible based on building code, avoided energy demand is estimated as the difference between the baseline, as described above, and the TEK10/TEK17 averages described in section 2.2.1.

For the impact calculations for the EPC eligible buildings, the energy demand is estimated from the achieved energy label based on the energy grade scale, see section 2.2.2. This demand is compared against the baseline as described above.

Table 4-2 below indicates how much more energy efficient the eligible parts of the portfolio is compared to the average residential Norwegian building stock, that is, compared to the criterion specific baselines. It also presents how much the calculated reduction in energy demand constitutes in CO2 emissions. The avoided energy usage and emissions of the eligible buildings are scaled down to reflect Askim & Spydeberg Sparebank's engagement relative to the objects' market value. Emissions are calculated using a European life cycle emission factor, as described in section 3.

Table 4-2 Area of eligible buildings in the portfolio and corresponding savings in energy usage and avoided emissions (CO2-eq) compared to baseline of the average residential building stock in Norway – in total and scaled by bank's share of financing.

	Area [m^2]	Avoided energy usage compared to baseline [GWh/year]	Avoided CO2 emissions [tonnes CO2/year]
Eligible buildings in portfolio	67,515	7.3	836
Eligible buildings in portfolio – scaled by the bank's share of financing	28,388	2.9	334

5 References

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