REPORT

SpareBank 1 Sørøst-Norge
Green Portfolio Assessment Report

CLIENT

SpareBank 1 Sørøst-Norge

SUBJECT

Criteria and portfolio assessment - Energy efficient residential and commercial buildings, renewable energy, district heating and manufacturing and technology

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SUBJECT	Criteria and portfolio assessment - Energy efficient residential and commercial buildings, renewable energy, district heating and manufacturing and technology	ACCESSIBILITY	Open
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Impact assessment for all of the examined asset classes in the portfolio of SpareBank 1 Sørøst-Norge qualifying according to the bank's Green Bond Framework, shows that the portfolio is dominated by renewable energy and energy efficient residential buildings. Significant contributions from energy efficient commercial buildings is supplemented by a small district heating/ bioenergy portfolio. The Manufacturing and technology category is not estimated at this stage. The table below sums up the impact in rounded numbers:

Energy efficient residential buildings	*6,200 ton CO_2e/year*
Energy efficient commercial buildings	*2,100 ton CO_2e/year*
Renewable energy	*6,300 ton CO_2e/year*
District heating/Bioenergy	*400 ton CO_2e/year*
Manufacturing and technology	*Not estimated*
Total	*15,000 ton CO_2e/year*

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1 Introduction

1.1 The Assignment

Multiconsult has been tasked by SpareBank 1 Sørøst-Norge to assess the green qualification criteria and the quantify the impact of the share of the bank's loan portfolio eligible for green bonds according to SpareBank 1 Sørøst-Norge's Green Bonds Framework. In this document we briefly describe the bank's green bond qualification criteria, the evidence for the criteria and the result of an impact assessment of the loan portfolio according to the criteria. A more detailed description of the eligibility criteria is available on the bank's website [1].

1.2 CO_2- emission factors and impact assessment

The eligible assets are producing renewable energy that is delivered into the existing power system or using electricity from the same system, while the district heating assets use bioenergy and are replacing electricity for heating. The stationary energy consumption[2] in Norway is dominated by electricity. This is especially clear for buildings where electricity is supplemented to a minor degree with district heating and bioenergy. The share of fossil fuels in the supply is very low and declining. Since 2020, fossil oil has been banned from being used in all buildings. The fuel mix in Norwegian district heating production in 2020 included only 3 % from fossil fuels (oil and gas) (Fjernkontrollen[3]).

In 2020, the Norwegian power production was 98% renewable (SSB[4]). As shown in Figure 1, the Norwegian power production mix (92% hydropower and 6% wind) resulted in emissions of 8 gCO_2/kWh. In the figure, the production mix is included for selected European countries for comparison.

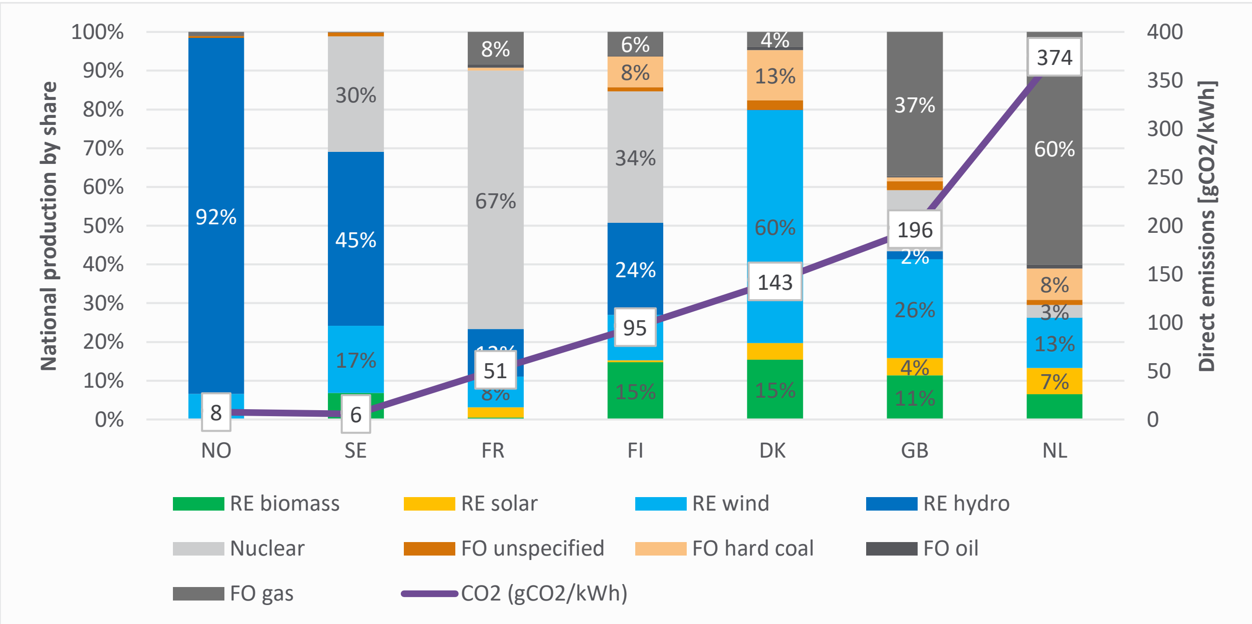


Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2020, Association of Issuing Bodies[5])

[1] https://www.sparebank1.no/nb/bv/om-oss/barekraft.html
[2] All energy consumption except transport
[3] http://fjernkontrollen.no/
[4] https://www.ssb.no/statbank/table/12824
[5] https://www.aib-net.org/facts/european-residual-mix

Power is traded internationally in an ever more interconnected European electricity grid. For impact calculations, the regional or European production mix is therefore more relevant than national production.

Using a life-cycle analysis, the Norwegian Standard NS 3720:2018 "*Method for greenhouse gas calculations for buildings*" takes into account international electricity trade and that the consumption is not necessarily equal to domestic production. The grid factor, as average in the lifetime of an asset, is based on an expected trajectory from the current grid factor to a close to zero emission factor in 2050 and then steady until the end of the lifetime.

According to the standard, the greenhouse gas emission factor for electricity used in buildings is to be calculated on a life-cycle basis according to two scenarios:

Scenario	**CO_2- factor (g/kWh)**
European (EU27+UK+Norway) consumption mix	136
Norwegian consumption mix	18

Table 1 Electricity production greenhouse gas factors (CO_2-equivalents), over a 60-year period, for two scenarios (source: NS 3020:2018, Table A.1)

The following calculations in this assessment apply the European mix listed in Table 1. Using the European mix is in line with *Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting* (February 2020)[6].

The average GHG emission intensity baseline for energy use in assets with a life span of 50-60 years, and assuming that the CO_2-factor of the European production mix is close to zero in 2050, is estimated to be 136 gCO_2/kWh. The same factor is also used for electricity input to district heating and power replaced by small hydropower plants in the portfolio. The bioenergy emission factor is set at 14 gCO_2/kWh heat delivered.

In order to calculate the impact on climate gas emissions, the trajectory is applied to all electricity consumption in all buildings. While electricity is the dominant energy carrier to Norwegian buildings, the energy mix also includes bio energy and district heating, as well as some use of heat pumps, resulting in a total specific factor of 124 g CO_2eq/kWh. A proportional relationship is assumed between energy consumption and emissions.

[6] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf

2 Residential buildings

SpareBank 1 Sørøst-Norge has defined the following eligibility criteria for Green Residential Buildings, for which eligible buildings must meet one:

1. Buildings built in 2021 or later with energy consumption that is 10% lower than national minimum requirements stated in the latest building code, or have a BREEAM-NOR Excellent certificate.
   (This criterion is not examined further by Multiconsult and also not considered in impact assessment as adequate object specific documentation is not available.)
2. Buildings built before 2021 with Energy Performance Certificate A
3. Buildings built before 2021 that comply with the Norwegian building code of 2010 (TEK10) and later codes are eligible for green bonds as all these buildings have significantly better energy standards and account for less than 15% of the residential building stock. A two-year lag between implementation of a new building code and the buildings built under that code must be taken into account.
4. Buildings built before 2021 with EPC-labels A or B. These buildings may be identified by using data from the Energy Performance Certificate (EPC) database.
5. Renovated Norwegian residential buildings which after renovation meets the criteria above, or renovations that achieve an improvement in energy-efficiency of at least 30%. (This criterion is not examined further by Multiconsult and not considered in impact assessment as adequate object specific documentation is not available.)

Multiconsult has studied the Norwegian residential building stock and presents in the following how the building code criterion (criterion 3 above) is justified by building stock statistics, historic building code development and building customs over the years. The following also examines the EPC-system and how the database of certificates may be used to identify eligibility criteria (criteria 2 and 4 above).

2.1 New or existing Norwegian residential buildings that comply with building code TEK10 or newer: 10%

Criterion 3 above.

Changes in the Norwegian building code have consistently over several decades resulted in increasingly energy efficient buildings. As of 2020, **10% of Norwegian residential buildings are built following TEK10** or a newer building code, well within 15% and thus being eligible according to the SpareBank 1 Sørøst-Norge criterion.

The methodology is in line with the Climate Bonds Initiative (CBI) taxonomy, where the top 15% most energy efficient buildings are considered eligible. The baseline and criterion are in line with, or stricter than, the CBI baseline methodology for energy efficient residential buildings for Norwegian conditions, which was published in spring 2018. The threshold of top 15% is in line with the relevant building acquisition and ownership of buildings criteria in the EU Taxonomy Delegated Acts[7].

[7] https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en

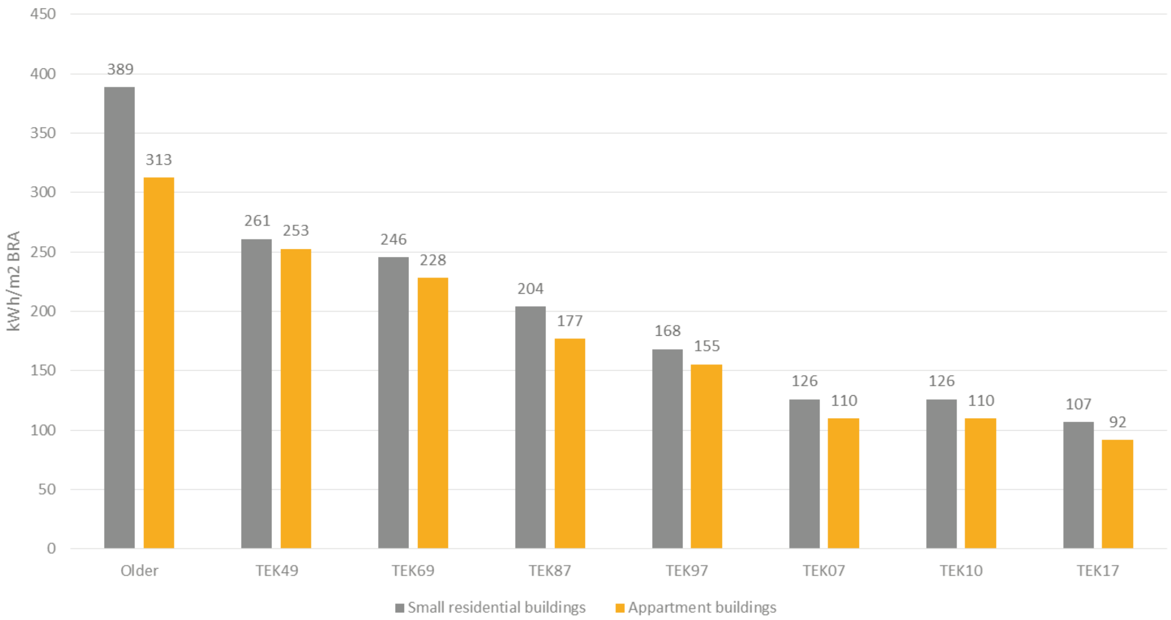


Figure 2 Development in calculated specific net energy demand based on building code and building tradition, (Multiconsult, simulated in SIMIEN)

Net energy demand is calculated using standard building models identical to the models used for defining the building codes (TEK10/TEK17). Figure 2 illustrates how the calculated energy demand declines with decreasing age of the buildings. From TEK10 to TEK17 the reduction is about 15%, and the former shift from TEK97 to TEK10 was 25%. It should be noted that for residential buildings, there was no change between TEK07 and TEK10 with respect to energy efficiency requirements.

The figure gives theoretical values for representative models of an apartment and a small residential building, calculated in the simulation software SIMIEN and in accordance with Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings - Method and data*, and not based on measured/actual energy use. In addition to the guidelines and assumptions from the standard, building tradition has also been considered. For older buildings, the calculated theoretical values tend to be higher than the actual measured use, mostly because the ventilation air flow volume is assumed to be the same as in newer buildings, while there is no heat recovery. Indoor air quality is not assumed to be dependent on building year. This is consistent with the methodology used in the EPC-system.

Building code	**Specific energy demand** **Apartment buildings (model homes)**	**Specific energy demand** **Small residential buildings (model homes)**
TEK10	110 kWh/m^2	126 kWh/m^2
TEK17	92 kWh/m^2	107 kWh/m^2

Table 2 Specific energy demand calculated for model buildings

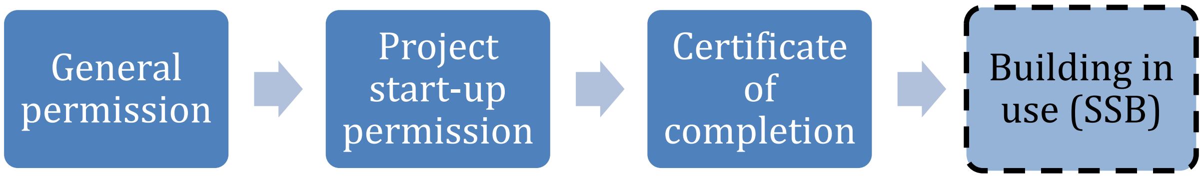
Table 2 shows the specific energy demand calculated by using the standard model buildings, for the building codes relevant for identifying the top 15% most energy efficient residential buildings in Norway.

The building codes are having a significant effect on the energy efficiency of buildings. An investigation of the energy performance of buildings registered in the EPC database that were built after 1997 show a clear improvement in the calculated energy level for buildings completed after 2008/2009 when the building code of 2007 came into force. Similar improvements can be observed between 1997 to 1998, after the building code of 1997 came into force.

In the period between 1998 and 2009, when there was no change in the building code, there is no observable improvement, however a small reduction in energy use might have taken place during those years. This might be due to an increased use of heat pumps in new buildings, and to a certain degree, improved windows.

2.1.1 Time lag between building permit and building period

Following the implementation of new a building code, there is a time lag before we see new buildings completed in accordance with this new code. The lag between the date of general permission received (in Norwegian: rammetillatelse), which decides which code is to be used, and the date at which the building is completed and taken into use varies a lot, depending on factors like the complexity of the site and project, financing and the housing market.



The time from granted general permission to granted project start-up permission is usually spent on design, sales and contracting. Based on Multiconsult's experience, a reasonable timespan for residential buildings in this phase is six months to a year. The figure below, based on statistics from Statistics Norway (SSB), indicates that a standard construction period for residential buildings lasts approximately six months to a year.

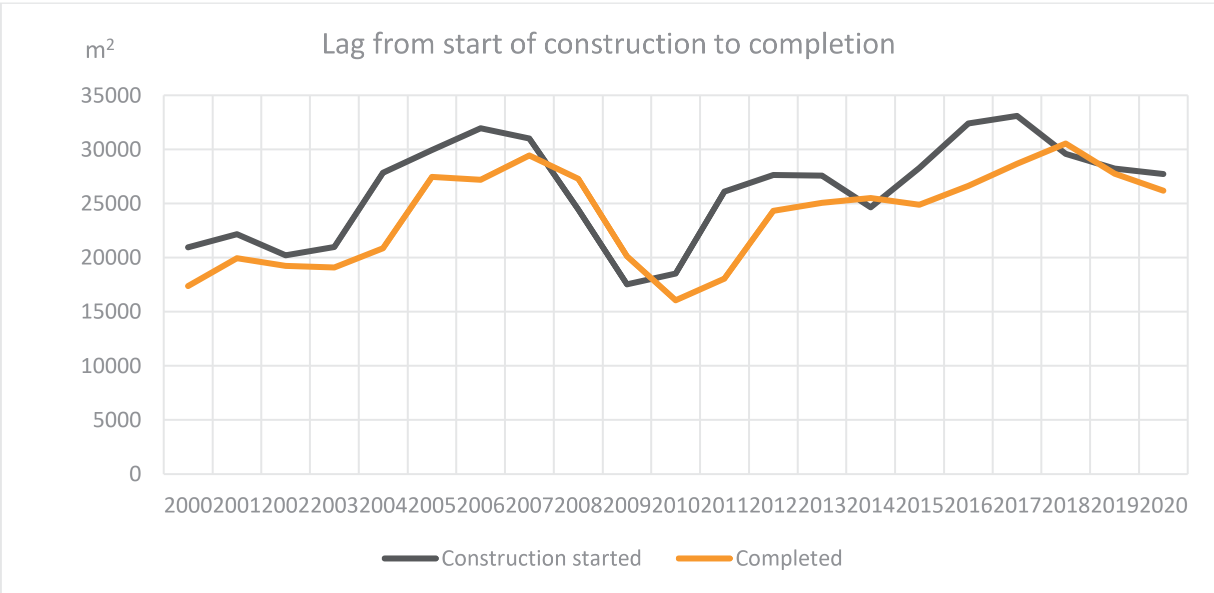


Figure 3 Project start-up and completion (Statistics Norway, bygningsarealstatistikken)

The 2010 building code was implemented on July 1st, 2010. Based on the discussions above, we regard a time-lag of two years between code implementation and completed buildings based on that code to be a robust and conservative assumption in most cases. The data available on completed construction is only available to the issuer on a yearly basis. Since the energy requirements were unchanged from TEK07 to TEK10, it is a very robust assumption that all buildings finished in 2012 have used energy requirements according to TEK10. There are likely buildings finished in 2011 built under the 2010 code as well, while at the same time, there might be buildings completed in 2012 based on TEK07.

2.1.2 Building age statistics

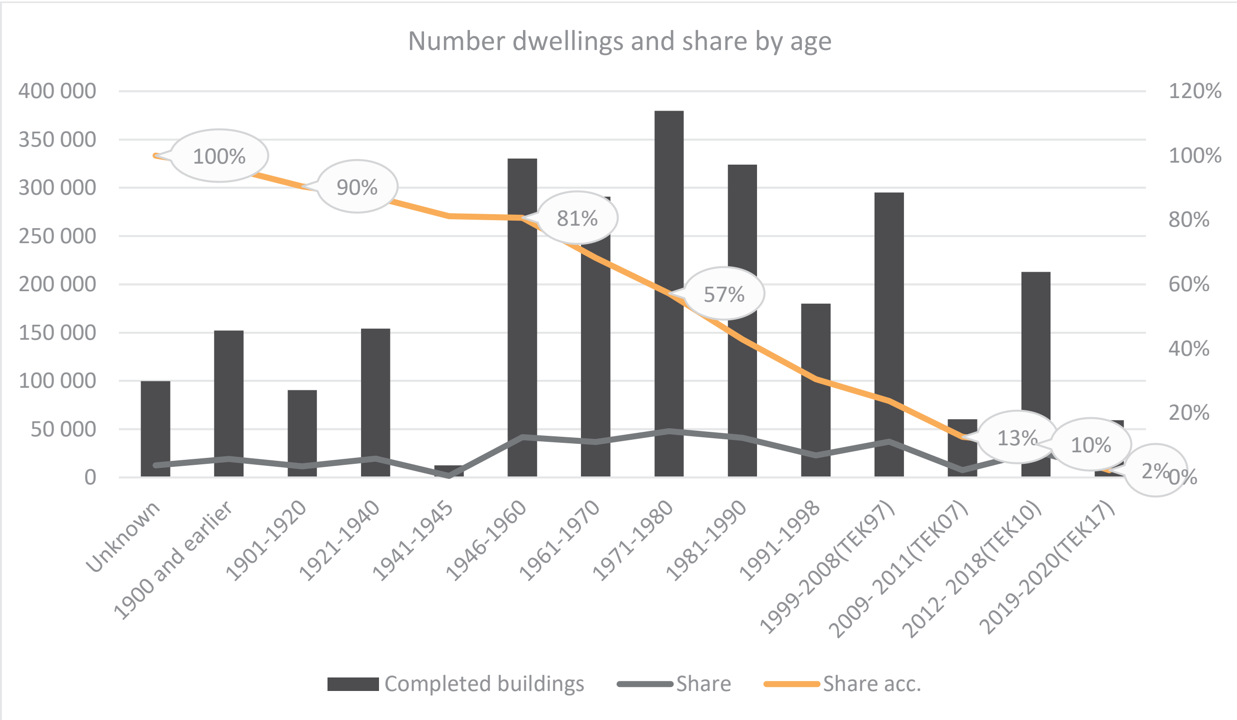


Figure 4 Age and building code distribution of dwellings (Statistics Norway and Multiconsult)

Figure 4 above shows how the Norwegian residential building stock is distributed by age. The same statistics are adjusted by new intervals using statistics on building area (Bygningsarealstatistikken). The figure shows how buildings finished in 2012 or later (built according to TEK10 or TEK17) make up 10% of the total stock. Based on theoretical energy demand in the same building stock, those 10% of the stock stand for 4% of the energy demand in residential buildings (Figure 5) and 3.6% of the associated CO_2-emissions (Figure 6). The difference between energy demand and CO_2-emissions can be explained by heating solutions in newer buildings being slightly less CO_2-intensive.

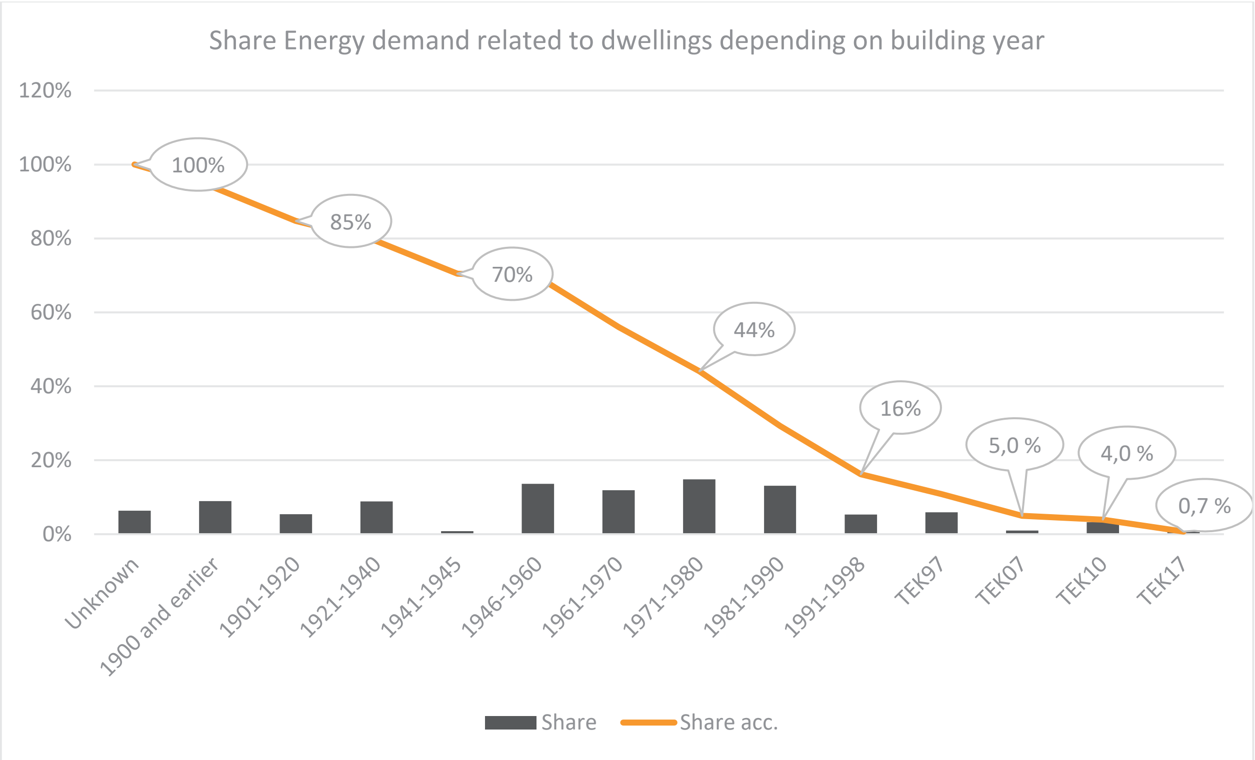


Figure 5 The building stock's relative share of energy demand (Statistics Norway and Multiconsult)

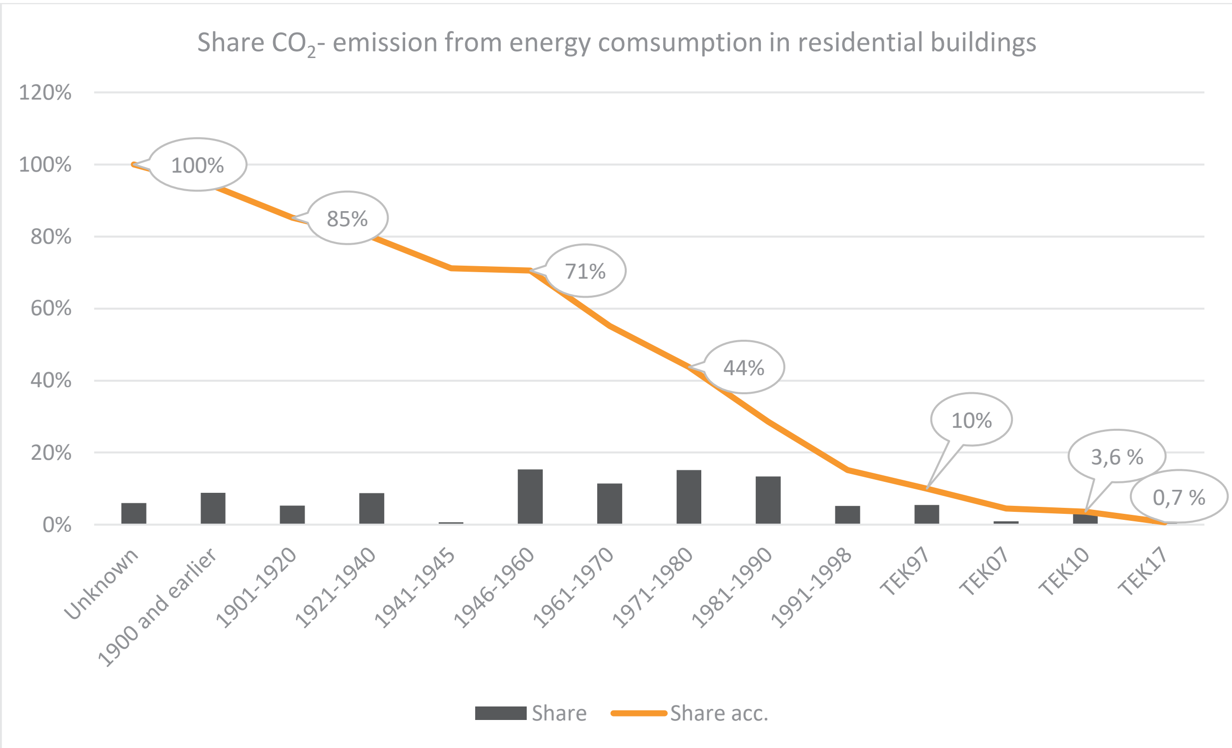


Figure 6 The building stock's relative share of CO2-emissions related to energy demand dependent on building year and code (Statistics Norway and Multiconsult)

Figure 7 and Figure 8 illustrate how the top 15% most energy efficient buildings may be identified by building code TEK10 (or later codes) until the end of 2024, and by building code TEK17 (or later codes) until the end of the year 2031. These projections are based on building statistics including buildings built in 2019 and NVE's building stock projections used in their energy demand projections.

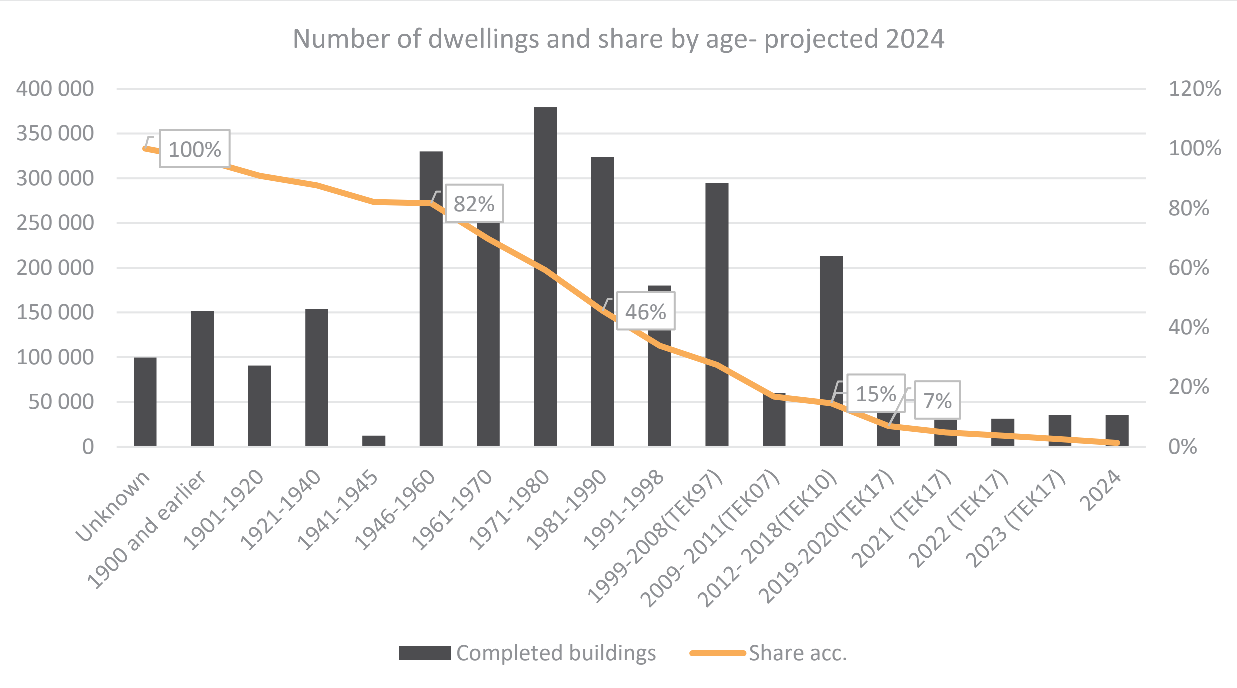


Figure 7 Age and building code distribution of dwellings projected in 2024 (Statistics Norway, NVE and Multiconsult)

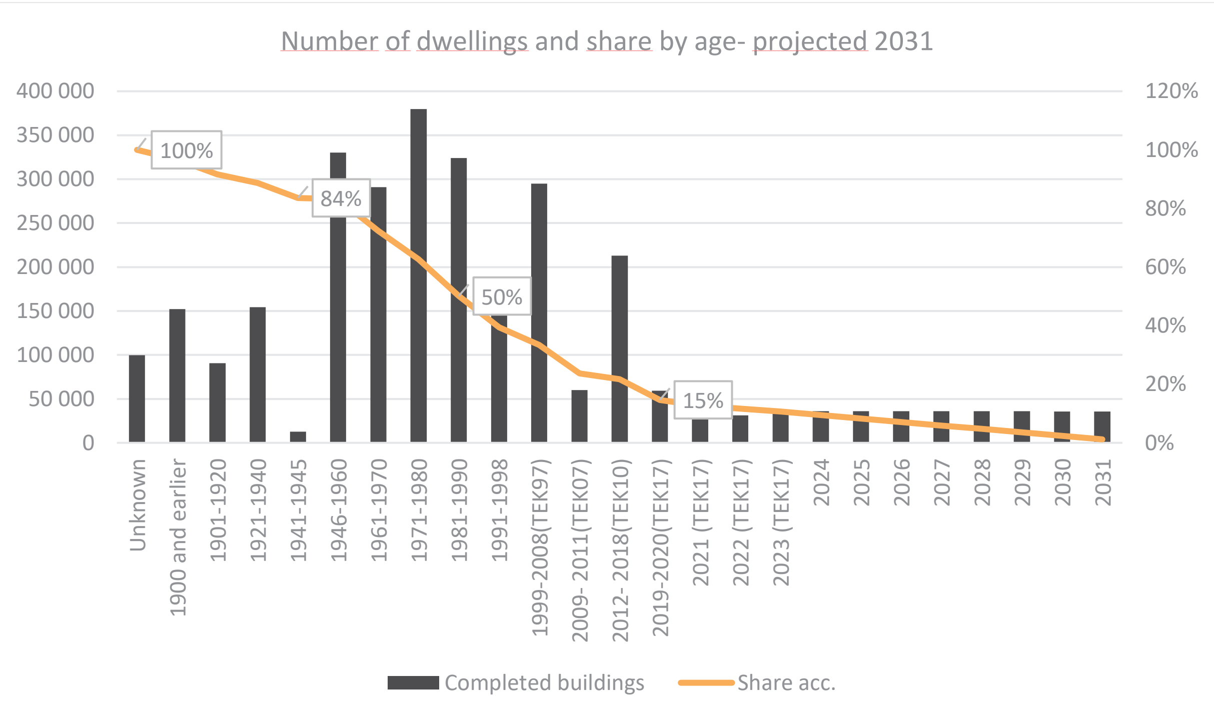


Figure 8 Age and building code distribution of dwellings projected in 2031 (Statistics Norway, NVE and Multiconsult)

2.1.3 Eligibility under a building code criterion

Over the last several decades, the changes in the building code have pushed for more energy efficient buildings and allows for identifying the 15% most energy efficient buildings based on building year. The national building stock data indicates that 10% of the current residential buildings in Norway were constructed using the building code of 2010 (TEK10). Combining the information on the calculated energy demand related to building codes in Figure 2 and information on the residential building stock in Figure 4, the calculated average specific energy demand on the total Norwegian residential building stock is 252 kWh/m^2. Building codes TEK10 and TEK17 give an average specific energy demand for existing houses and apartments, weighted for actual stock, of 117 kWh/m^2, which is 54% lower than the average.

2.2 Norwegian residential buildings with EPC-labels A or B

Criterion 2 and 4 on page 7.

2.2.1 Identification of energy efficient residential buildings through EPC labels

The Energy Performance Certificate (EPC) system is another source for identifying assets eligible for green mortgages. All buildings with an energy grade of A or B are eligible as green residential buildings according to this criterion.

The Energy Certificate Performance System became operative in 2010. It was made mandatory for all new residences finished after the 1st of July 2010 and all residences that are sold or rented out to have an Energy Performance Certificate.

The figure below shows the distribution of residential buildings with EPCs in Norway by building code, and their certificate label.

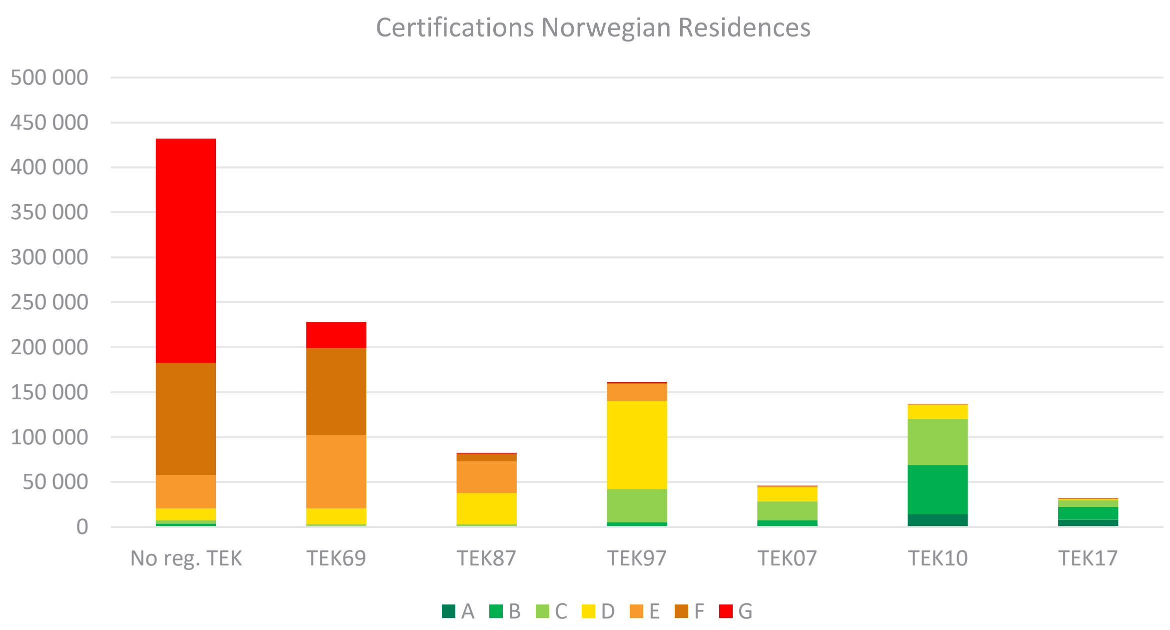


Figure 9 Residences in Norway with Energy Performance Certificates distributed per building code and energy grade in the EPC system. The numbers are based on statistics from the EPC database (representing no more than 42% of the total building stock).

The properties already registered in the EPC database are considered to be representative for all the residential buildings built under the same building code. However, they are not representative for the total stock, as younger buildings are highly overrepresented in the database. There is currently a coverage ratio of EPC labels relative to the total residential building stock of no more than 42%.

2.2.2 EPC grading statistics

Short facts about the Norwegian EPC

The energy label in the EPC system is based on calculated delivered energy, including the efficiencies of the building's energy system (power, heat pump, district energy, solar energy etc.). The building codes are defined by net calculated energy, not including the building's energy system.

The EPC does as of today consist of an energy label (A-G) and a heating label (defined as colour). The heating label is seldom used, and not considered relevant in the context of the criteria.

Registration is performed in two ways. Professionals with necessary credentials must certify new buildings and non-residential buildings. Non-professional building-owners that are selling their house or apartment can however do the certification themselves in a simplified registration system. The latter system is based on simplified assumptions and conservative values, and its results are therefore less precise and might give a lower energy label than when professionals do the registration.

The energy grade is a result of calculated energy delivered to the residential building in "normal" use. The calculation method is described in the Norwegian Standard NS 3031. The table below shows the relationship between calculated energy delivered per square meters and energy grades for houses and apartments. This is the current grade scale:

Delivered energy per m² heated space (kWh/m²)							
	A	**B**	**C**	**D**	**E**	**F**	**G**
Houses	95	120	145	175	205	250	above F
Sq. m adjustment	+800/A	+1600/A	+2500/A	+4100/A	+5800/A	+8000/A	
Flats/Apartments	85	95	110	135	160	200	above F
Sq. m adjustment	+600/A	+1000/A	+1500/A	+2200/A	+3000/A	+4000/A	

Table 3 Delivered energy EPC energy labels (Source: www.energimerking.no)
A = heated floor area of the dwelling
Example: a 150 sq. m *small residential building (house)* → a C qualification limit of 145+(2500/150) = 161.67 kWh/m²

The grading system and C-label

The C-grade for residential buildings is defined so that a building built after the building codes of TEK2007 and TEK2010 in most cases should receive a C.

The limit value for reaching a C is calculated based on representative models of a small residential building and an apartment, built according to the building codes of 2007/2010, with an assumed moderate system efficiency for the building's energy system.

Residences built according to the building code of 2010, which are included in criterion 3, will hence mostly get a C or better, but might in some cases get a D. Extracting only buildings built before 2009 from the EPC database, 5% of the total registered buildings have a C or better. These are buildings that have initially been built with, or through refurbishment attained, higher energy efficiency standards than what the original building year (and respective building code) would imply.

As can be seen in Figure 9, some buildings built after TEK 07/10 have indeed received a D. However, these are often 'strong' D's and will by a margin still be among the top 15% of most energy efficient residences and will be included according to criterion 3.

The Norwegian EPC-system requires every apartment to be certified separately. However, the defined limit values in the grading system are set for an average apartment. An apartment located on the top or bottom floor or at a corner will have a higher heat loss and may very well get a lower grade than other apartments in the same building. Hence, a TEK10 building may have apartments with energy label C and D, and in some rare cases even an energy label E. But these apartments are still more energy efficient than apartments with similar locations in older apartment buildings and are therefore qualified through criterion 3.

Since a dominant part of the certifications for residential buildings are done in the simplified registration mode, and not by professionals, a larger share of existing TEK10-buildings gets a D, and in some rare cases even an E. This is in many cases due to the more conservative calculation methods used in this simplified registration mode. Another reason why some existing houses and apartments built according to TEK10 receive a D, is that the grade scale has been revised and made stricter three times between 2011 and 2015. E.g., a small residential building that was graded a C when it was new in 2012, could be graded a D in 2015.

Therefore, most of the D-certificates (and in more rare cases even E) for TEK07/10-buildings are due to either one or a combination of the above-mentioned aspects; the conservative method of calculation in the simplified registration system, unfavourable location of an apartment in apartment buildings, a geometrically unconventional building form with higher energy losses than the representative model, and/or the revised stricter grading scale. In sum, the building itself is not necessarily less energy efficient.

Figure 10 shows the energy grades in granted certificates to Norwegian residential buildings.

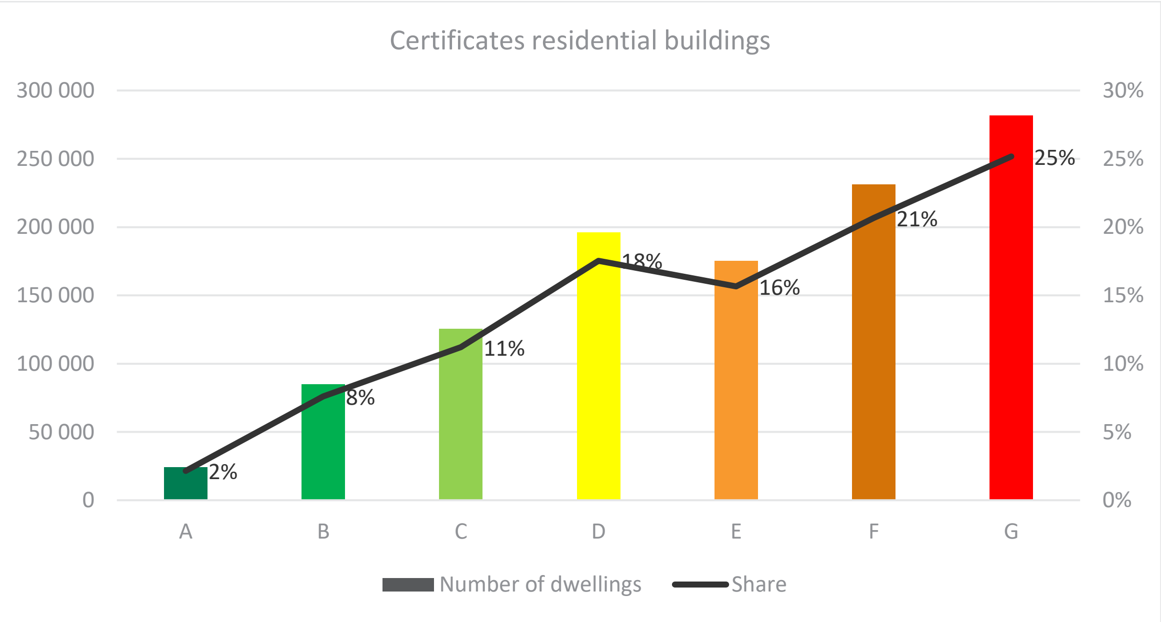


Figure 10 Energy Performance Certificates by grade- residential buildings only, representative only of buildings with EPCs (Source: energimerking.no, December 2020)

The EPC coverage is, however, not equally distributed over the building stock.

Figure 11 compares the number of buildings with EPCs and in the total building stock, by the building code according to which they were built to illustrate the distribution of building age. It also shows how much of the building stock is represented in the EPC database. This illustrates how newer buildings are overrepresented in the EPC database. Note that EPC data is regularly updated and the data behind the figure include nearly all new registrations in 2020. Building stock data is only updated on a yearly basis, and the figure includes buildings finished until the end of 2020.

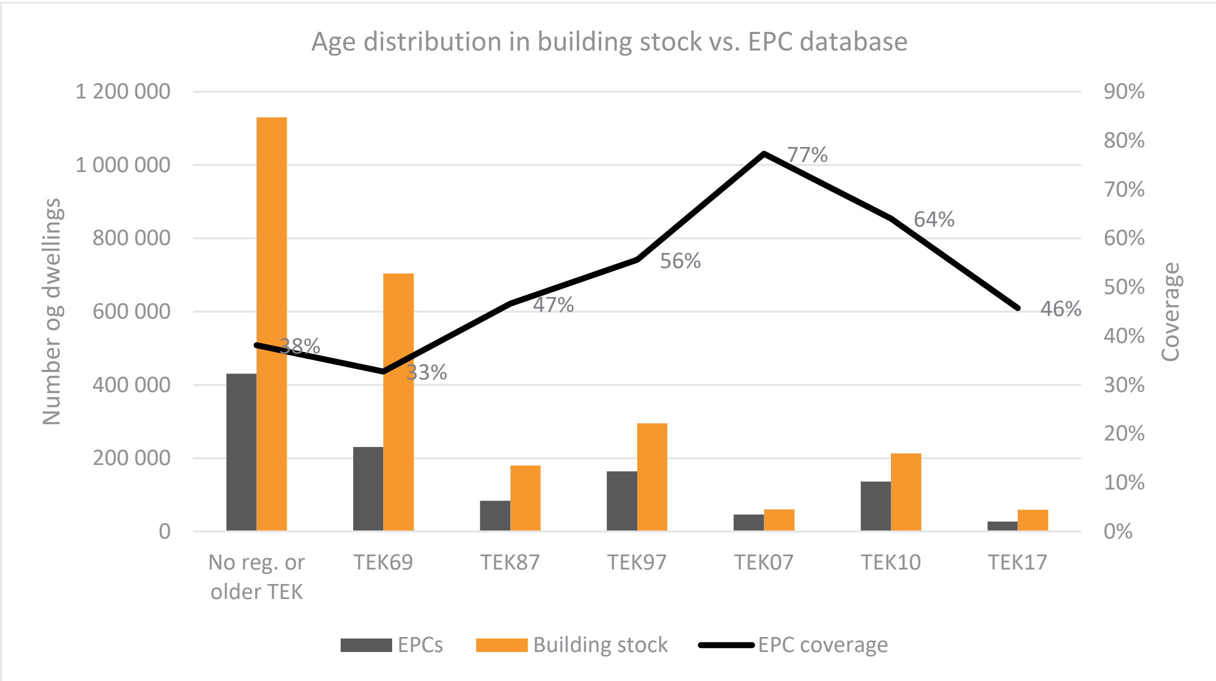


Figure 11 Age distribution in Energy Performance Certificates vs. actual residential building stock and EPC coverage by building year (Source: energimerking.no December 2020 and Statistics Norway incl. 2020 figures)

Assuming registered EPCs for each time period are representative for the building stock, it is possible to indicate what the label distribution would be if all residential buildings were given a certificate. Figure 12 illustrates how EPCs would be distributed based on this assumption. 7% of the residences would have a B or better. 15% of the residences would have a C or better.

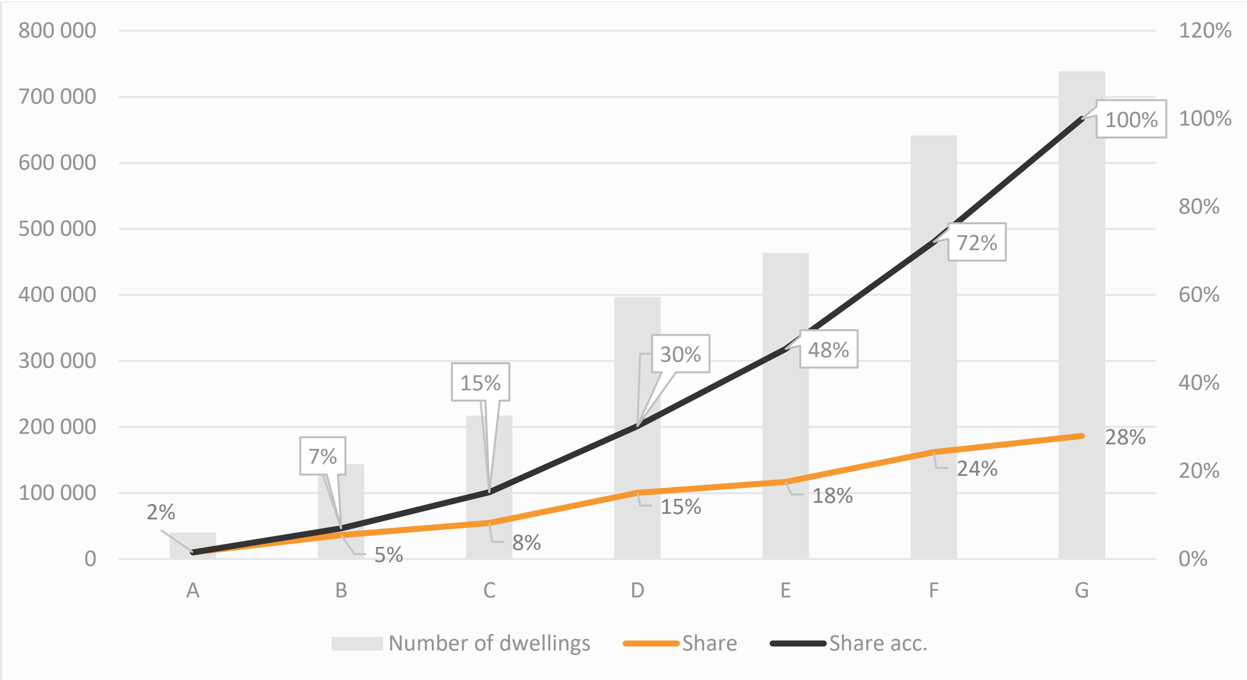


Figure 12 EPCs extrapolated to include the whole residential building stock (Source: energimerking.no and Statistics Norway, Multiconsult)

2.2.3 *Eligibility under EPC-related criteria*[8]

An Energy Performance Certificate is mandatory for new buildings and existing residential buildings that are sold or rented out, and the criterion is set at EPC energy grade A or B. The EPC data indicates that 7% of the current residential buildings in Norway will have a B or better.

2.3 Impact assessment - Residential buildings

A reduction of energy demand from the average 252 kWh/m^2 of the total residential building stock to 121 kWh/m^2 (TEK10) or 102 kWh/m^2 (TEK17) depending on building code, is multiplied to the emission factor and the area of the eligible assets to calculate impact for buildings qualifying to the building code criterion.

For the buildings qualifying according to the EPC-criterion only, the difference between achieved energy label and weighted average in the EPC database is used.

Eligibility is first checked against the building code criterion. The ones that do not qualify according to that are checked against the EPC-criterion, to ensure that no double counting of objects will occur.

The 3320 eligible residential buildings in SpareBank 1 Sørøst-Norge's portfolio are estimated to amount to about 374 000 square meters, where the majority of those, 3188 objects, is eligible through the building code criterion. Of the 132 older objects qualifying according to the EPC-criterion, 2% have energy label A and the rest have energy label B.

[8] Work is ongoing to remodel the EPC system. The changes are expected to be substantial and require a supplementary EPC eligibility criterion. For the purpose of green bonds, this is expected to be relevant in 2023.

Data on dwelling area for this analysis was largely made available by the bank. For the few objects where this data was not available, the qualifying building area is calculated based on average area per building sub-category derived from national statistics (Statistics Norway[9]).

	Area qualifying buildings in portfolio [m²]				Area qualifying in total [m²]
	TEK10	TEK17	EPC A	EPC B	
Apartments	84 839	31 746		3 449	120 034
Small residential houses	187 620	47 476	980	17 762	253 838
Sum	272 459	79 222	980	21 211	373 872

Table 4 Eligible residential objects and qualifying building area

Based on the calculated figures in tables 1 and 4, the energy efficiency of this part of the portfolio is estimated.

The calculated average specific energy demand for the TEK10 and TEK17 assets is 117 kWh/m². This is 54 % lower than the calculated average of the total residential building stock.

The table below indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock. It also presents the calculated associated avoided CO_2-emissions.

	Area [m²]	Lower energy consumption compared to baseline [GWh]	Lower CO_2-emissions compared to baseline [tons CO_2/yr]
Buildings eligible under the building code criterion	351 681	47 453	5 891
Buildings eligible under the EPC criterion	22 191	2 294	285
Eligible buildings in portfolio - total	**373 872**	**49 747**	**6 176**

Table 5 Performance of eligible residential objects compared to average building stock

The bank’s engagement in the qualifying objects makes up a share of the object value. This has not been accounted for in these calculations.

[9] Table 06513: Dwellings, by type of building and utility floor space

3 Commercial buildings

SpareBank 1 Sørøst-Norge has defined the following eligibility criteria for Green Commercial Buildings, for which eligible buildings must meet one:

1. Buildings built in 2021 or later with energy consumption that is 10% lower than national minimum requirements stated in the latest building code, or have a BREEAM-NOR 3.0 Excellent certificate.
   (This criterion is not examined further by Multiconsult and also not considered in impact assessment as adequate object specific documentation is not available.)
2. Buildings built before 2021 with Energy Performance Certificate A
3. Buildings built before 2021 that comply with the Norwegian building code of 2010 (TEK10) and later codes are eligible for green bonds as all these buildings have significantly better energy standards and account for less than 15% of the residential building stock. A time-lag between implementation of a new building code and the buildings built under that code must be taken into account.
4. Buildings built before 2021 with EPC-labels A or B. These buildings may be identified by using data from the Energy Performance Certificate (EPC) database.
5. Buildings built before 2021 having a BREEAM-NOR Excellent certificate or better with minimum 6 credits from the Energy efficiency category.
   (This criterion is not examined further by Multiconsult and not considered in impact assessment as adequate object specific documentation is not available.)
6. Renovated Norwegian commercial buildings which after renovation meets the criteria above, or renovations that achieve an improvement in energy-efficiency of at least 30%.
   (This criterion is not examined further by Multiconsult and not considered in impact assessment as adequate object specific documentation is not available.)

Multiconsult has studied specific subcategories of the Norwegian commercial building stock and presents in the following how the building code criterion (criterion 3 above) is justified by building stock statistics, historic building code development and building customs over the years. Unique criteria have been established for the following four subcategories: office buildings, retail buildings, hotel and restaurant buildings and industrial buildings/warehouses. The following also examines the EPC-system and how the database of certificates may be used to identify eligibility criteria (criteria 2 and 4 above).

Data quality and sources

To establish a robust methodology, data on number and age of existing buildings are crucial. The data on number of buildings and age in the total stock have good quality for the whole stock in the most relevant period, which is the most recent years and even for a period beyond the criteria cut-off points. These statistical data have been published from 2000. Some building categories are only available on an aggregated level, but the necessary splits are made on the basis of data available for the years 2006 and 2018. Building years for older buildings are somewhat uncertain and assumptions on building rate and demolition rate had to be made. Regarding building area, data is available on new buildings every year from 1983. These data have been supplemented with data in a study on energy efficiency in existing buildings.[10]

3.1 New or existing commercial buildings that comply with the threshold building code

Criterion 3 on page 19.

New or existing Norwegian commercial buildings that that comply with the Norwegian building code of 2010 (TEK10) or later codes:

- Hotel and restaurant buildings built 2013 or later (3-year lag): 7.0 %
- Office buildings built 2012 or later (2-year lag): 4.9%
- Retail buildings built 2012 or later (2-year lag): 4.9%
- Industrial buildings and warehouses built 2012 or later (2-year lag): 13.6%

Changes in the Norwegian building code have consistently over several decades resulted in more energy efficient buildings.

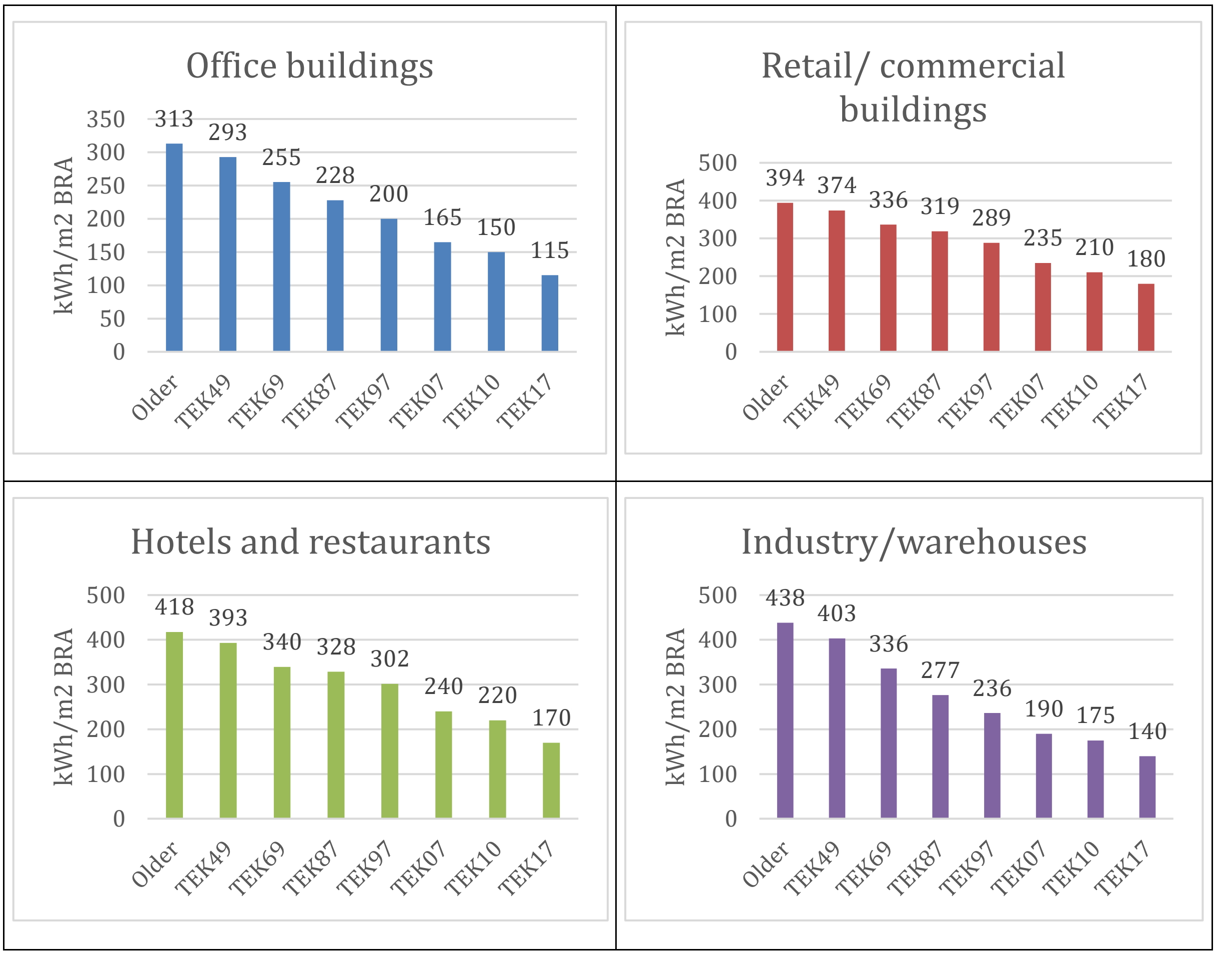


Figure 13 Development in calculated specific net energy demand based on building code and building tradition (Multiconsult, simulated in SIMIEN)

Net energy demand is calculated using the same building models that were used for defining the building code. The result presented in Figure 13 illustrates how the calculated energy demand declines

[10] Enova publication "Potensial- og barrierestudie Energieffektivisering i norske yrkesbygg", Multiconsult 2011

with decreasing age of the buildings. From TEK10 to TEK17 the reduction was in the range 14 to 23%. The reduction from TEK07 to TEK10 was about 10%, and from TEK97 to TEK07 about 20%.

Figure 13 presents theoretical values for representative models of an office building, retail/commercial building, hotel building and industry/ warehouse, calculated in the software SIMIEN and in accordance with Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings - Method and data*, and not based on measured/actual energy use. In addition to the guidelines and assumptions from the standard, building tradition has also been considered. Indoor air quality is assumed not to be dependent on building year. It is assumed that older buildings (TEK69 and older), that originally had natural ventilation or mechanical exhaust with relatively small air volumes, have at one time upgraded to balanced ventilation with satisfactory air volumes - this is assumed to be a necessary upgrade the property owner had to do to meet the tenancy requirements. Many older buildings underwent such upgrades in the 1980s and 1990s. For these, a minimum allowable airflow from NS 3031: 2014 Table A.6 is used. This is the same methodology as used in the EPC-system.

Building code	Specific energy demand			
	Office buildings	Retail/commercial buildings	Industrial buildings/ warehouses	Hotels and restaurants
TEK 10	150 kWh/m^2	210 kWh/m^2	175 kWh/m^2	220 kWh/m^2
TEK 17	115 kWh/m^2	180 kWh/m^2	140 kWh/m^2	170 kWh/m^2

Table 6 Specific energy demand as from the building codes

Table 6 includes the specific energy demand as a maximum requirement in the respective building codes, relevant for identifying the top 15%, within a safe a margin, most energy efficient commercial buildings in Norway.

The building codes have a significant effect on the energy efficiency of the buildings.

3.1.1 Time lag between building permit and building period

Following the implementation of new a building code there is a time lag before we see new buildings completed in accordance with this new code. First there is some transition period where two codes are overlapping. Further, the lag between the date of general permission received (in Norwegian: rammetillatelse), which decides which code is to be used, and the date at which the building is completed and taken into use varies a lot, depending on factors like the complexity of the site and project, financing, the market and the building category.

The time from granted general permission to granted project start-up permission is usually spent on design, sales and contracting. Based on Multiconsult’s experience, a reasonable timespan for commercial buildings in this phase is six months to a year. As an illustration, the figure below, based on statistics from Statistics Norway (SSB), indicates that a standard construction period for office buildings is approximately six months to a year.

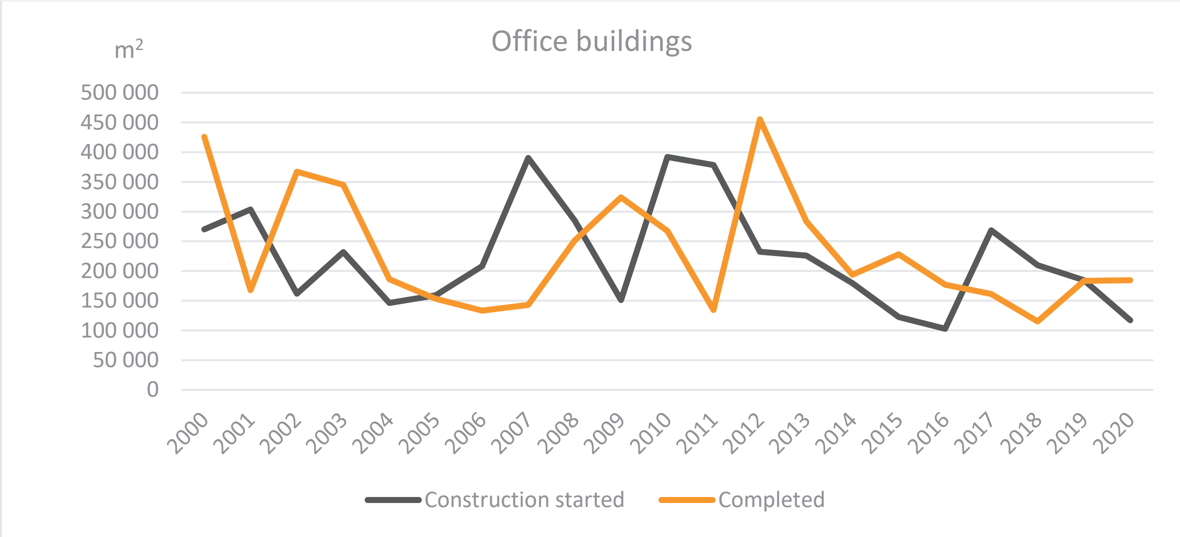


Figure 14 Project start-up and completion (Statistics Norway, bygningsarealstatistikken)

Based on the discussions above, we regard a time lag of two years for offices, retail and industry/ warehouses between code implementation and completed buildings based on that code to be a robust and conservative assumption. Hotel and restaurant buildings are typically more complex buildings, thus a time lag of three years is assumed for this category. The data on completed construction is only available to the issuer on a yearly basis.

3.1.2 Building age statistics

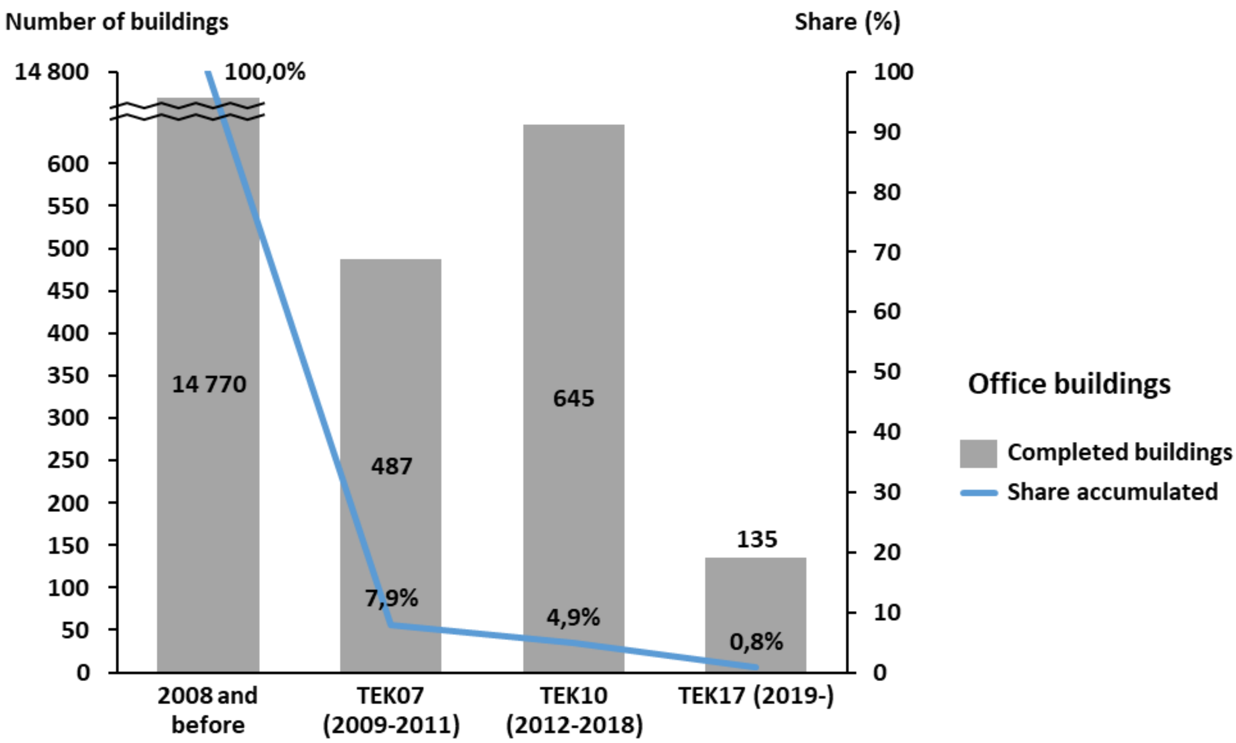


Figure 15 Age and building code distribution of ***office buildings*** *(Statistics Norway and Multiconsult)*

Figure 15 above shows how the Norwegian office building stock is distributed by age, categorized by building code. The figure also shows that office buildings finished in 2012 and later (built according to TEK10 and TEK17) amount to 4.9% of the total stock. The three figures below include the same information for the other three subcategories.

The quality of the commercial building stock data is somewhat poor, and projections for the future growth in the building stock are highly uncertain. However, assuming that the building stock grows by 1-2% every year, the TEK10 threshold is estimated to be valid until 2028 for office and retail buildings, until 2024 for hotel and restaurant buildings, and until 2023 for small industrial buildings and warehouses. In a few years, these thresholds must be adjusted to TEK17.

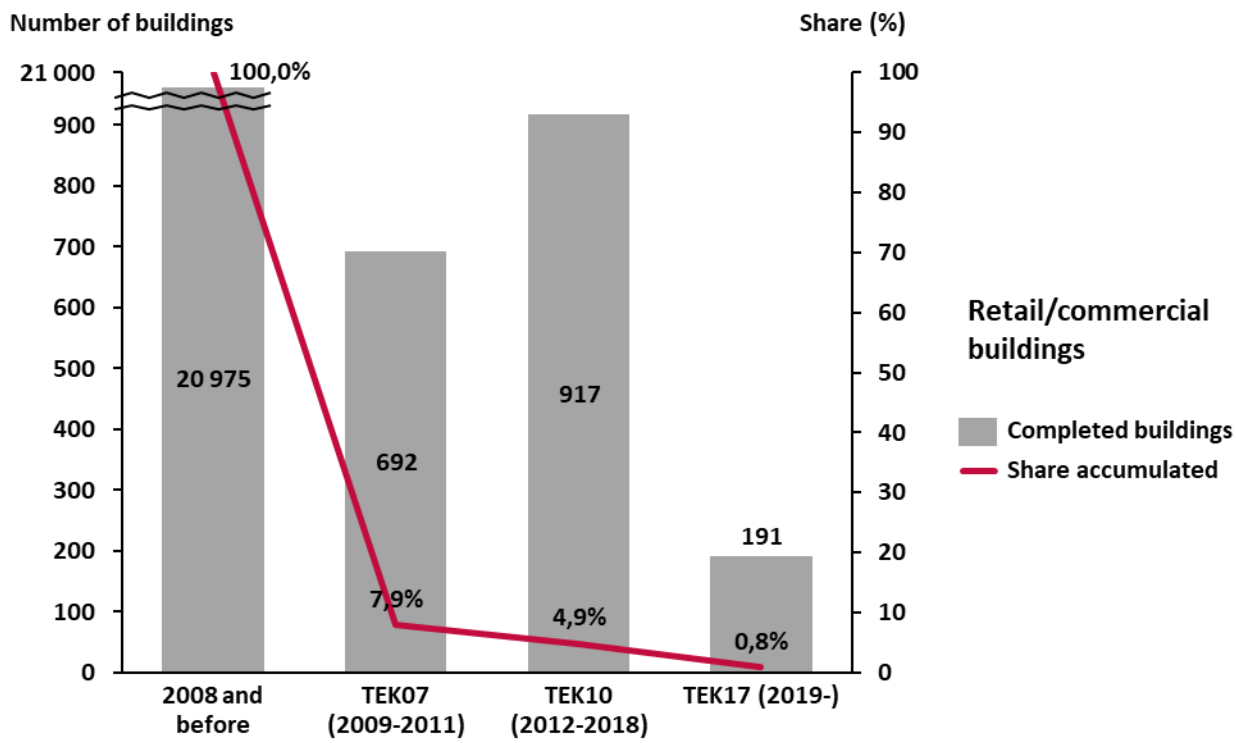


Figure 16 Age and building code distribution of ***commercial/retail buildings*** *(Statistics Norway and Multiconsult)*

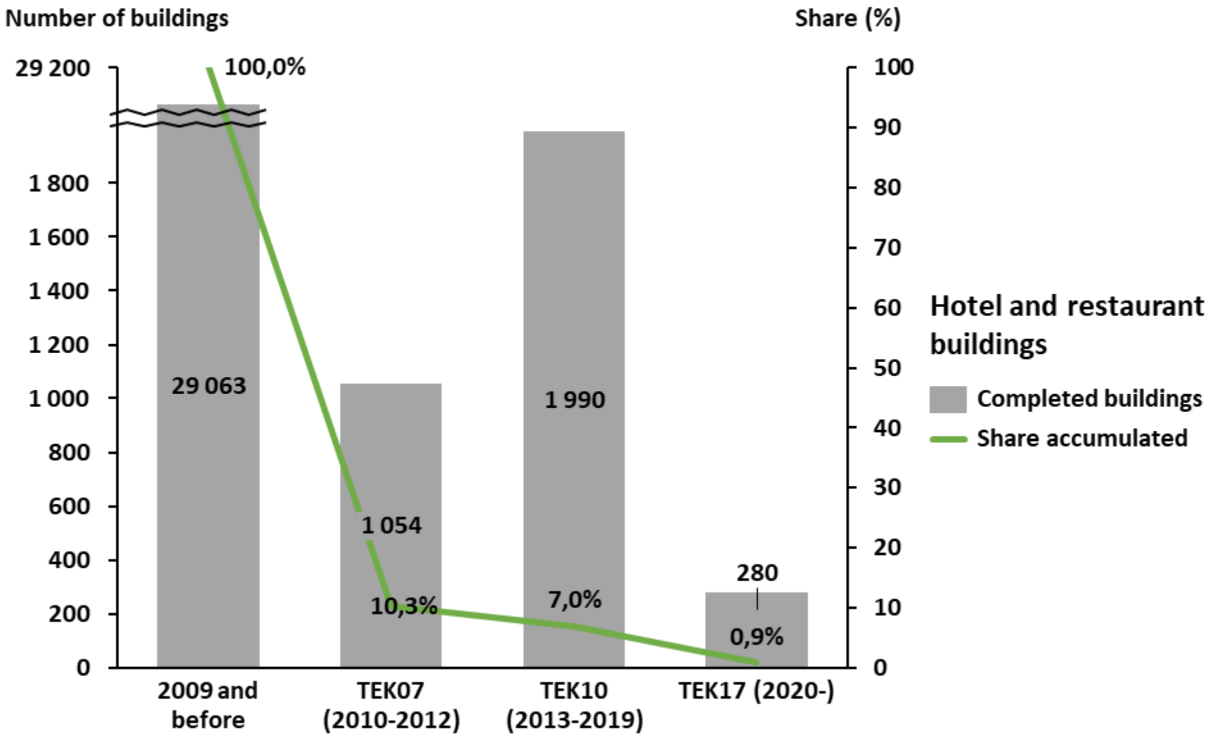


*Figure 17 Age and building code distribution of **hotel and restaurant buildings** (Statistics Norway and Multiconsult)*

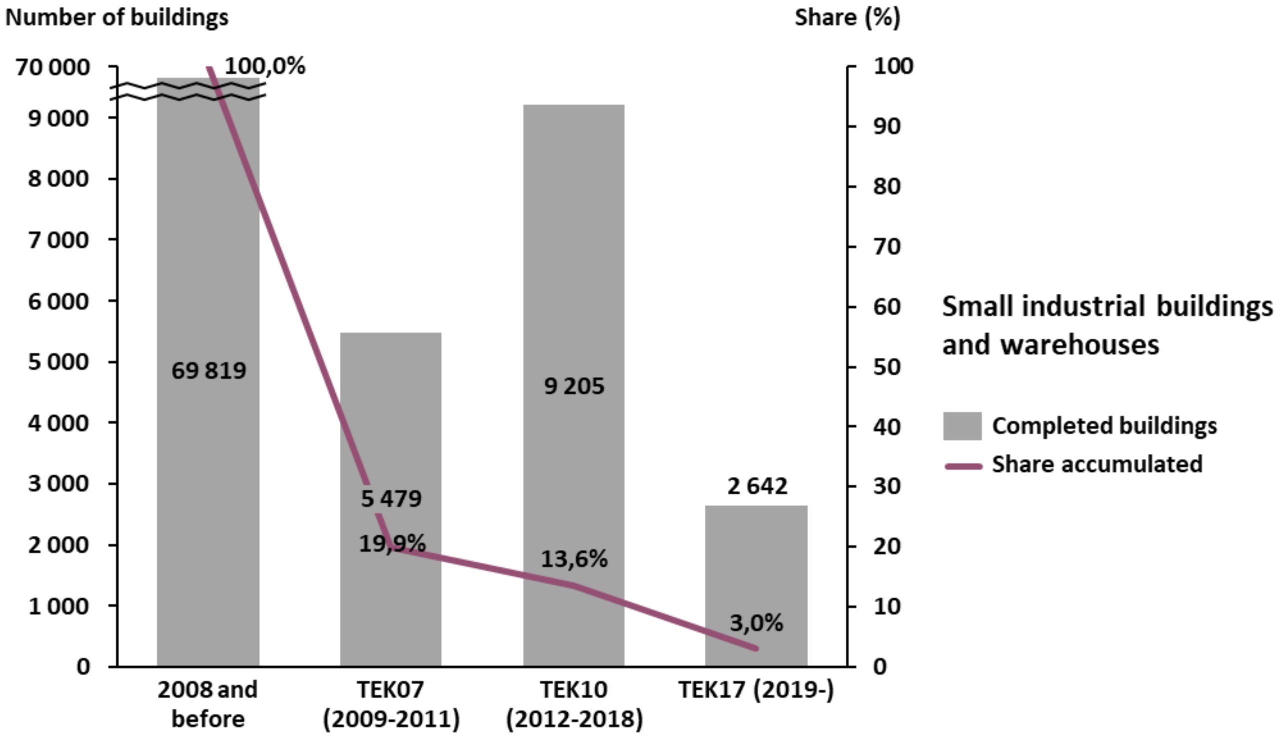


*Figure 18 Age and building code distribution of **small industrial buildings and warehouses** (Statistics Norway and Multiconsult)*

Figures 19 through 22 below show how the energy demand in the total building stock in the building subcategories (based on theoretical energy demand) is divided between buildings from different periods. The same picture is similar for share of CO_2- emissions.

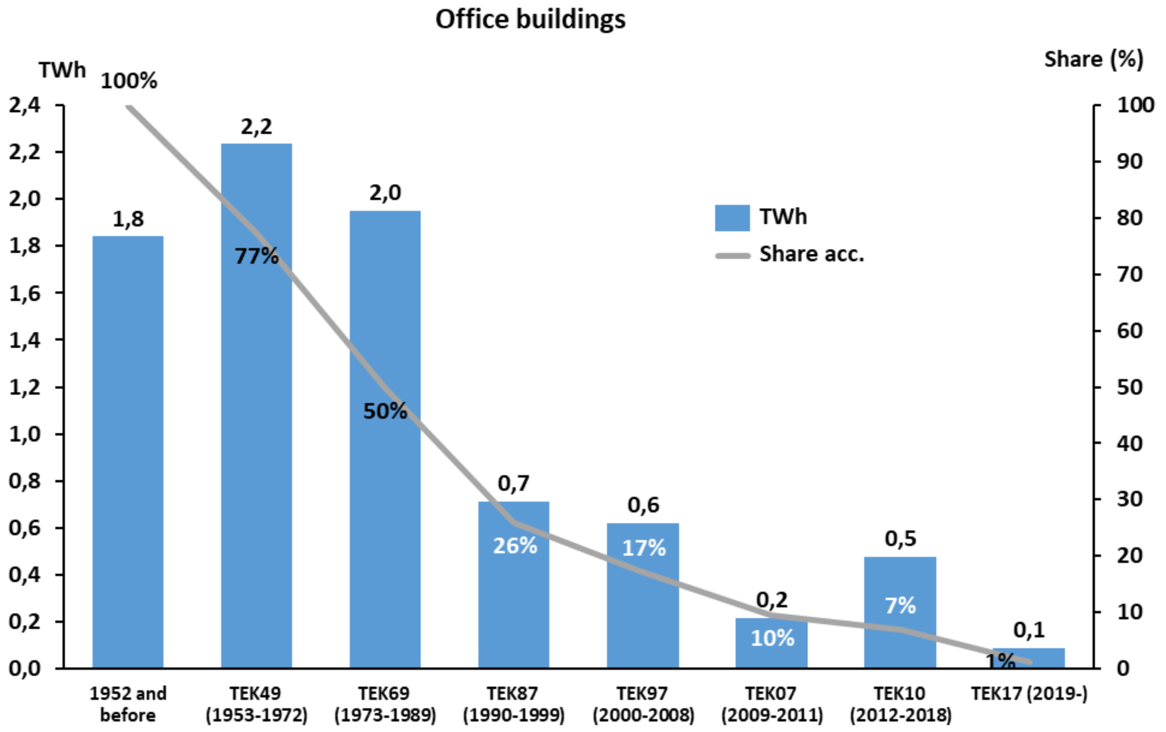


*Figure 19 Share energy demand related to **office buildings** depending on building year*

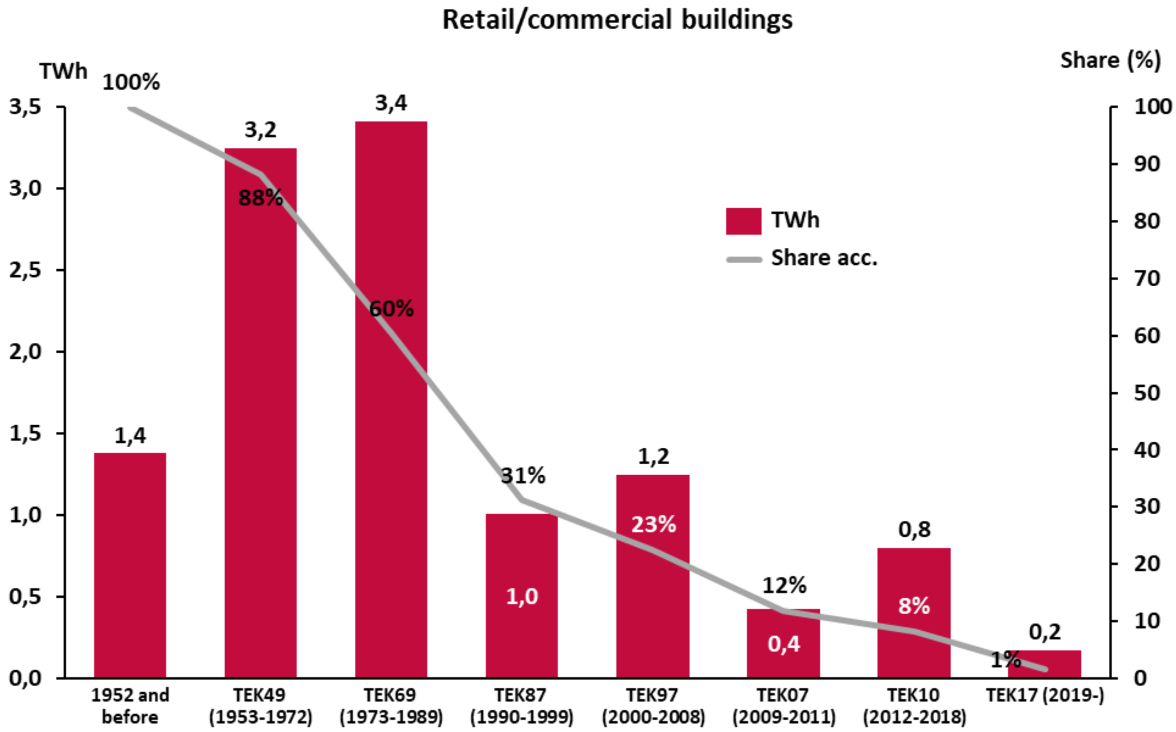


Figure 20 Share energy demand related to retail buildings depending on building year

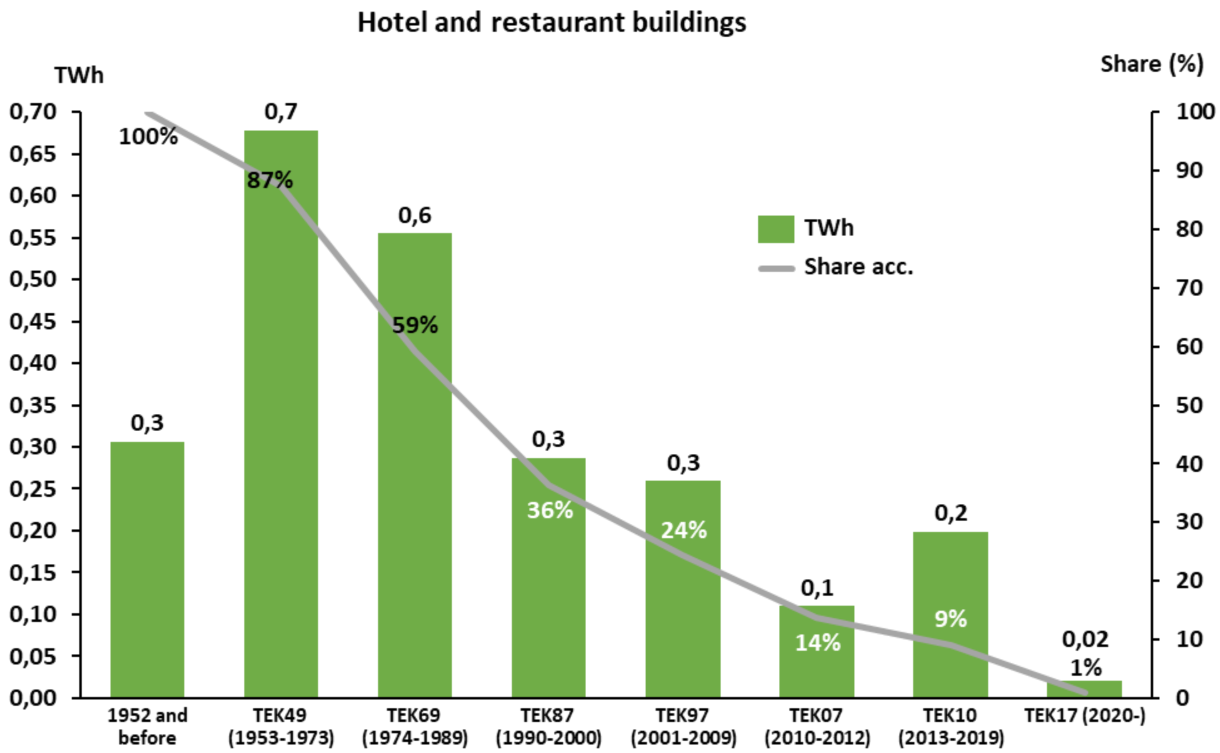


Figure 21 Share energy demand related to ***hotel and restaurant buildings*** *depending on building year*

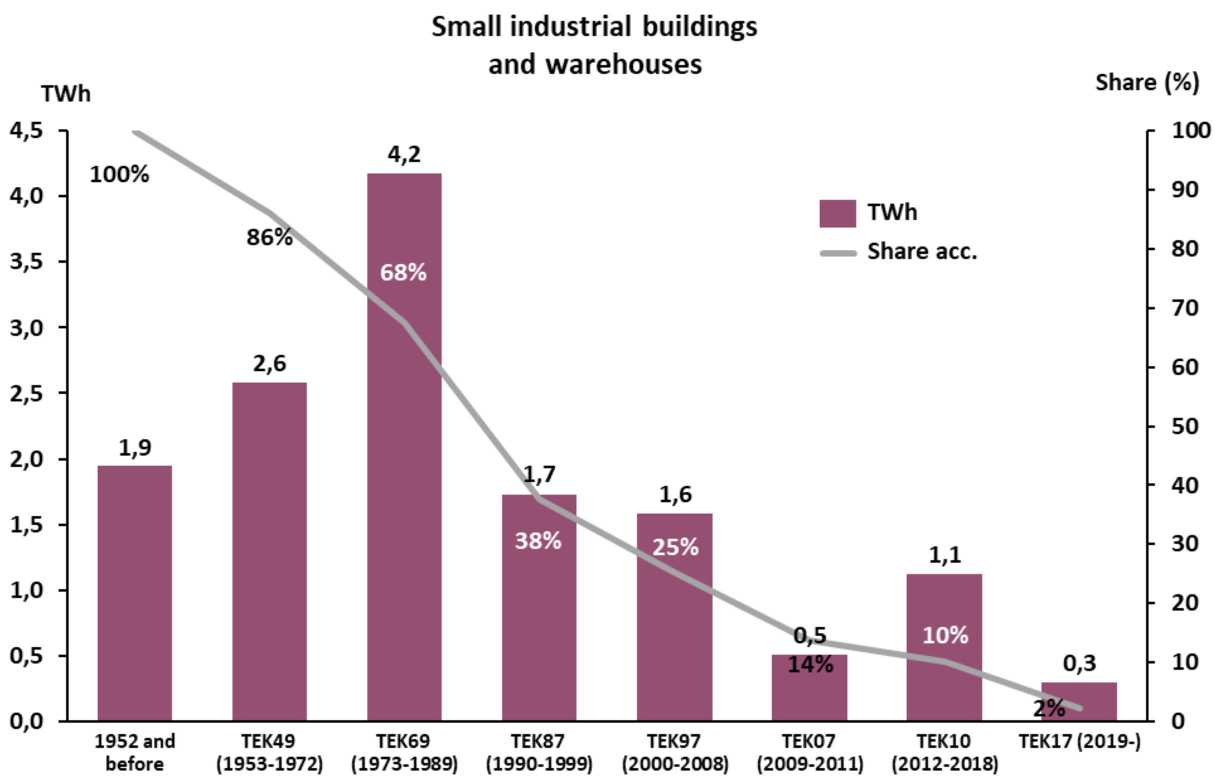


Figure 22 Share energy demand related to small industrial buildings and warehouses depending on building year

3.1.3 Eligibility under the building code criterion

Over the last several decades, the changes in the building code have pushed for more energy efficient commercial buildings. Combining the information on the calculated specific energy demand related to building code in Figure 13 and information on the commercial building stock in figures 15 through 18, average specific energy demand has been calculated for the examined subcategories. The results are presented in the table below, both for the total buildings stock and for the newer and qualifying part of the stock, as well as the relative reduction in energy demand.

	Total stock average [kWh/m^2]	Qualifying buildings average [kWh/m^2]	Reduction [kWh/m^2]
Office buildings	250	143	43 %
Retail/commercial buildings	321	204	37 %
Hotel buildings	330	214	35 %
Small industry and warehouses	294	166	43 %

Table 7 Average specific energy demand for the building stock; total stock, share eligible according to criteria and reduction

3.2 Existing Norwegian commercial buildings with EPC-labels A or B

Criterion 2 and 4 on page 19.

For all of the commercial building in the subcategories that have been examined (office buildings, retail buildings, industrial buildings and warehouses, hotel and restaurant buildings), the EPC statistics indicate that buildings with a grade A and B make up 13% of all commercial buildings with certificates. The certificates are, however, not equally distributed among the buildings in the stock. Newer, and consequently, better performing buildings are overrepresented, making 13% a high estimate.

Based on registered certifications in the EPC database, a baseline energy label for relevant building categories for qualifying buildings in the portfolio based on simple average, is presented in Table 8. The specific energy demand, a more granular basis for the calculated baseline, is used in the subsequent impact assessment. Due to this, the values in the table are not all identical to limit values in the EPC system.

Building categories	Average energy label	Specific energy demand [kWh/m^2]
Office	**E**	248
Hotel and restaurant	**E**	330
Commercial/ retail	**D**	290
Industrial and small warehouse buildings	**E**	315

Table 8 Average specific energy demand and energy labels dependent on building category

For commercial buildings, the EPC coverage ranges from 38% combined for office and retail buildings, to below 5% for hotel and restaurant buildings, small industry buildings and warehouses. The available data has been extrapolated assuming the registered buildings are representative for their age group regarding energy label.

3.3 Impact assessment - Commercial buildings

The eligible commercial buildings in SpareBank 1 Sørøst-Norge's portfolio are estimated to amount to ~136 000 square meters. Buildings are qualified by the building code criterion first, and only older buildings are qualified by the EPC criterion to avoid double counting. In SpareBank 1 Sørøst-Norge's commercial portfolio, all but one combined office/industry building have been qualified by the building code criterion. One older building qualified with an EPC B.

The difference between average specific energy demand for each subcategory in the building stock and the average for qualifying buildings is multiplied by the emission factor and area of eligible assets to calculate impact for buildings qualifying to the building code criterion.

	Area of qualifying buildings in portfolio [m^2]			
	TEK10	TEK17	EPC B	Total
Office buildings	34 815	5 924	368	41 107
Retail/commercial buildings	21 793	12 632		34 425
Hotel and restaurant buildings	-	6 178		6 178
Industrial and small warehouse buildings	42 486	10 911	664	54 061
Sum	99 094	35 645	1 032	135 771

Table 9 Building area of eligible commercial objects

Based on the figures presented in Table 7 and Table 9, the energy efficiency of this part of the portfolio is estimated.

The table below indicates how much more energy efficient the eligible part of the portfolio is compared to the average Norwegian commercial building stock, and the associated reduction in CO_2-emissions.

	Lower energy demand compared to baseline	Lower CO_2-emissions compared to baseline
Eligible buildings in portfolio	**16.4 GWh/year**	**2 051 tons CO_2/year**

Table 10 Performance of commercial eligible objects compared to average building stock

The bank's engagement in the qualifying objects makes up only a share of the total object value. When scaled by the loan-to-value factor, the impact is estimated to 12.3 GWh and 1,540 tons CO_2 per year.

4 Renewable energy

Hydropower is clearly the dominant power production solution in Norway and has been for 100 years since the beginning of the industrialisation in the country. With the current mix of production capacity in the system, hydropower is expected to account for about 89% of the national power production in a normal year[11].

Investments in wind power has increased substantially over the last years and wind power is now expected to account for about 9% of the national power production in a normal year.

Power production development in Norway is strictly regulated and subject to licencing and is overseen by Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of Petroleum and Energy. Awarded licenses grant rights to build and operate power production installations under explicit conditions and rules of operation. NVE puts particular emphasis on preserving the environment. The Norwegian part of the NVE homepage gives detailed information about requirements for different types of projects[12].

Data about the assets in the portfolio are available from Norwegian Water Resources and Energy Directorate (NVE) as all assets are subject to licencing.

4.1 Eligibility

The main eligibility criteria for hydropower are in line with the Climate Bonds Initiative (CBI) criteria[13] & the EU Taxonomy[14]. For Norwegian hydropower, these criteria are easily fulfilled and most assets overperform radically.

- All run-of-river power stations have no or negligible negative impact on GHG-emissions.
- Due to the cold climate and high power density of Norwegian hydropower, reservoirs are not exposed to significant cyclic revegetation of impoundment and hence the negative impacts on GHG-emissions from these reservoirs are small.
- Hydropower stations with high hydraulic head and/or relatively small impounded area have high power density

CBI has published eligibility criteria for hydropower. These criteria have a mitigation component and an adaptation and resilience component. The mitigation component requires power density > 5 W/m^2 or emission intensity < 100 gCO_2/kWh.

The adaptation and resilience component in the CBI hydropower eligibility criteria addressing adaptation, biodiversity, and water resource topics, is in the Norwegian context covered by the requirements in the Norwegian regulation of power plants. Hence, all Norwegian hydropower assets conform to very high standards regarding environmental and social impact.

The eligibility criteria mentioned above are also central in the EU Taxonomy. Most *do no significant harm* (DNSH) requirements in the taxonomy are covered by current national regulation of hydropower, nevertheless, there are a few exemptions. The requirements regarding documentation of eligibility of each asset are not addressed in this assessment.

[11] https://www.nve.no/energiforsyning/kraftproduksjon/?ref=mainmenu
[12] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[13] https://www.climatebonds.net/standard/hydropower
[14] https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en

4.2 Impact assessment - Renewable energy

4.2.1 CO_2-emissions from renewable energy power production

All power production facilities have a negative impact on GHG-emissions. Instead of calculating the impact on GHG-emissions for all assets in the portfolio (most of which are rather small), we refer to The Association of Issuing Bodies (AIB). AIB is responsible for developing and promoting the European Energy Certificate System – "EECS".

The Association of Issuing Bodies (AIB)[15] uses an emission factor of 6 gCO_2e/kWh for all European hydropower in calculations of the European residual mix. The value is based on a life-cycle analysis where all upstream and downstream effects in the whole value chain for power production are included. In subsequent assessments we are using the AIB emission factors for all assets, even though they are higher than factors reported in other credible sources. For instance, the average GHG emission intensity for Norwegian hydropower (all categories) has been calculated, using LCA, to 3.33 gCO_2e/kWh (Norsus, 2019[16]). For the type of assets in the portfolio, with many run-of-river and small hydropower assets, the AIB emission factor is regarded as conservative for an impact assessment. The positive impact of the hydropower assets is 130 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh presented in section 1.2.

4.2.2 Power production estimates

The planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's (NVE) hydropower database[17]. For small hydropower, stated power production given in the concession documents do not necessarily represent what can realistically be expected from the plant over time. One issue is that the hydrology is uncertain, and unfortunately often overestimated in early project phases for small hydropower. There is, however, also the fact that the production figures normally do not account for planned and unplanned production stops, due to accidents, maintenance, etc. Research on small hydropower has shown that actual production often is more than 20% lower than the concession/pre-construction figures. There is no equivalent evidence to suspect the same mismatch for large hydropower.

4.2.3 Portfolio analysis – New or existing Norwegian renewable energy plants

The available data in open sources include type of plant, installed capacity, production in normal year, age and location.

An important feature of all powerplants in the portfolio is that they are run-of-river plants with negligible impounded areas. The expected production of renewable energy in the table below is the total production of the plants and not representative of the bank's relative engagement (share of total value) in the plants, neither are the resulting avoided CO_2-emissions.

	Capacity range [MW]	# of plants	Total capacity [MW]	Expected production [GWh/yr]	Reduced CO_2-emissions compared to baseline
Eligible hydropower plants in portfolio	0.4 - 4	7	12	**48**	**6 266 tons CO_2/year**

Table 11 Capacity and production of hydropower plants in the portfolio

[15] AIB is responsible for developing and promoting the European Energy Certificate System - "EECS"
[16] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf
[17] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/

5 District heating/ Bioenergy

District heating is expanding in Norway and production in 2020 (which was a rather mild year, temperature wise), was 6.1 TWh according to statistics gathered by the district heating association[18]. These statistics do not cover all smaller district heating systems, but still provides a good indication of total production and production mix. District heating is produced from a mix of energy sources based on local availability. According to the same source, the most dominant heat sources are waste incineration and industrial waste heat, making up 52% of total production in 2020. Bioenergy covered 21% of demand, while heat pumps and electricity covered 23%. Fossil energy is playing a diminishing part in the mix, with fossil oil and gas representing 3% of the mix in 2020.

District heating with installed capacity over 10 MW is regulated by the energy act and subject to licencing and is overseen by Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of Petroleum and Energy. Awarded licenses grant rights to build and run district heating production and distribution installations under explicit conditions and rules of operation. NVE puts particular emphasis on preserving the environment. Emissions are regulated by the Pollution Control Act. The Norwegian part of the NVE homepage gives detailed information about different requirements for different types of projects[19]. Data about the assets subject to licencing are available from NVE.

The district heating assets in the SpareBank 1 Sørøst-Norge, however, are small (<1 MW) and production data are not made available yearly in publicly available sources.

The smaller assets are regulated by the Planning and Building Act. These smaller assets normally have a small footprint.

5.1 Eligible assets in portfolio

Multiconsult has investigated the SpareBank 1 Sørøst-Norge portfolio of bioenergy and district heating assets. As the assets are small and do not deliver data to open sources, the production estimates and production mix is based on information in news articles and on company revenues.

All assets are small assets (<1MW) with biomass boilers as the baseload. The bioenergy is expected to be locally sourced wood chips, and the production mix to be 85% bioenergy and 15% electricity.

The total production is assumed to be 5 GWh.

5.2 Impact assessment - District heating/ Bioenergy

5.2.1 CO_2-emissions from district heating

To calculate the positive impact of the district heating serving demand in buildings, the most relevant Norwegian baseline is the combination of direct electric heating, electric boilers, bioenergy and heat pumps. This baseline is estimated to 124 gCO_2/kWh as described in section 1.2.

As district heating production mixes differs between assets, so do the emission factors. In this portfolio we assume the same production mix for all assets. The grid factor is set at 136 gCO_2/kWh. Bioenergy is regarded to be emission free, however, transporting bioenergy to the boiler does require some use of fossil energy. The emission factor for wood chips-based heat delivered is set at 14 gCO_2/kWh, which

[18] Fjernkontrollen.no
[19] https://www.nve.no/konsesjon/konsesjonssaker/?type=A-7

is in line with other sources such as the standard BREEAM-NOR[20]. Based on a production mix of 85/15, the resulting factor for district heating in this portfolio is calculated to be 32 gCO_2/kWh. Hence the impact of the district heating assets in the portfolio is estimated to be 92 gCO_2/kWh (*124 - 32*).

5.2.2 Portfolio analysis – New or existing Norwegian district heating/ bioenergy plants

The table below summarises the expected heat energy produced by the eligible assets in the portfolio in an average year, and the avoided CO_2-emissions resulting from the heat energy production.

	Produced heat compared to baseline	Reduced CO_2-emissions compared to baseline
Eligible plants in portfolio	**5 GWh/year**	**435 tons CO2/year**

Table 12 Heat production and estimated positive impact on GHG-emissions

6 Manufacturing and technology

SpareBank 1 Sørøst-Norge has included a wider sustainability category called "Manufacturing and technology" in their framework. The bank has identified loans in this category to companies that positively contribute to one or several of the goals described in the EU Taxonomy as well as the UN sustainability development goals.

At this point, the bank does not have access to data on the most relevant indicators for an impact assessment, however, the intention is to report on this category at a later stage.

[20] https://byggalliansen.no/wp-content/uploads/2019/06/SD-5075NOR-BREEAM-NOR-2016-New-Construction-v.1.2.pdf