REPORT

# Skue Sparebank
# Green Portfolio Impact Assessment 2023

CLIENT

Skue Sparebank

SUBJECT

Impact assessment - energy efficient residential and commercial buildings, and renewable energy

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**REPORT**

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In summary, the assessed impact is significant for all examined asset classes in the Skue Sparebank portfolio qualifying according to the bank's green bond criteria.

The total impact of the assets in the portfolio is 4,300 ton $CO_2$e/year:

| | |
|---|---|
| *Energy efficient residential buildings* | *1,083 ton $CO_2$e/year* |
| *Energy efficient commercial buildings* | *148 ton $CO_2$e/year* |
| *Renewable energy* | *3,026 ton $CO_2$e/year* |
| *Total* | *4,257 ton $CO_2$e/year* |

When scaled by the banks share of financing, the impact is estimated to 1,800 ton $CO_2$e/year:

| | |
|---|---|
| *Energy efficient residential buildings* | *576 ton $CO_2$e/year* |
| *Energy efficient commercial buildings* | *69 ton $CO_2$e/year* |
| *Renewable energy* | *1,215 ton $CO_2$e/year* |
| *Total* | *1,860 ton $CO_2$e/year* |


| | | | | | |
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| 00 | 04.07.2023 | Draft | STJ, KJRK | KJRK, STJ | STJ |
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# TABLE OF CONTENTS

## Contents

# 1 Introduction

### Assignment

On assignment from Skue Sparebank, Multiconsult has assessed the impact of the part of the bank's portfolio eligible for green bonds.

In this document we briefly describe Skue Sparebank's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio of Skue Sparebank. More detailed documentation on eligibility criteria is made available on Skue Sparebank's website[1].

## 1.1 $CO_2$- emission factors related to electricity demand and production

The eligible assets are either producing renewable energy and delivering into the existing power system or using electricity from the same system. The energy consumption of Norwegian buildings is also predominantly electricity, with some district heating and bioenergy. The share of fossil fuel is very low and declining.

As shown in figure 1, the Norwegian production mix in 2022 (88% hydropower and 10% wind) results in emissions of 7 $gCO_2$/kWh. The production mix is also included in the figure for other selected European states for illustration.

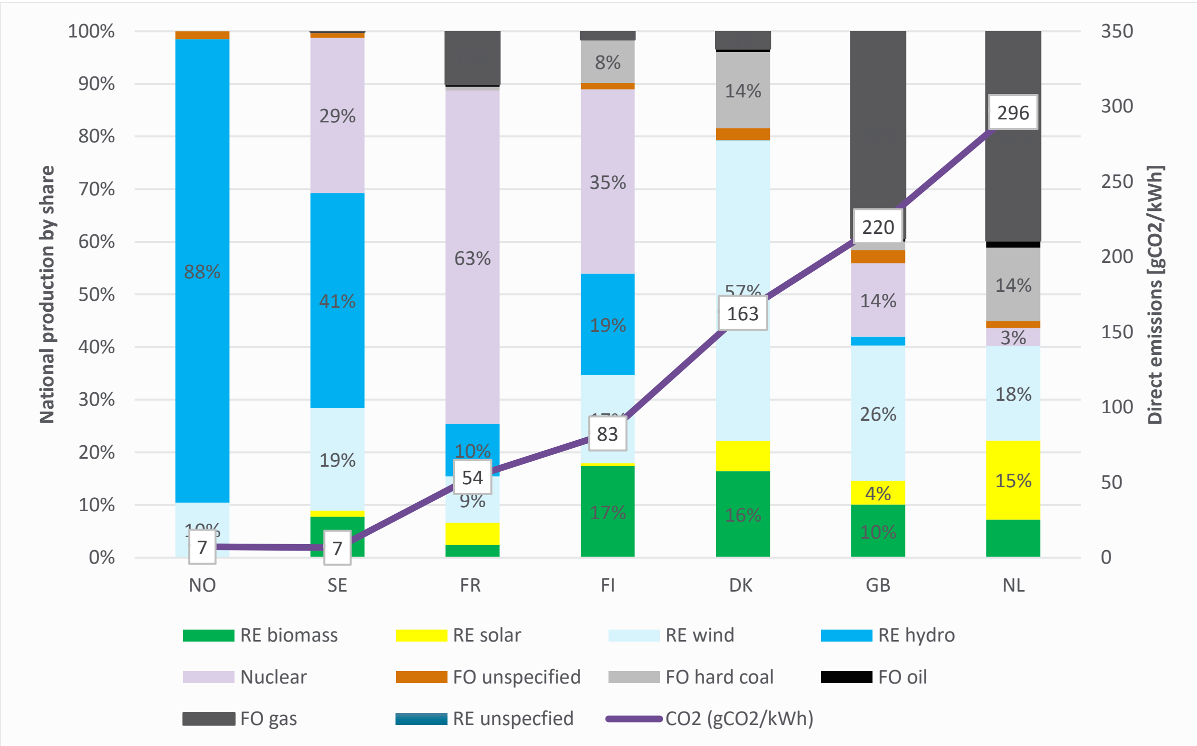


*Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2022, Association of Issuing Bodies[2])*

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

[1] https://www.skuesparebank.no/InvestorRelations
[2] https://www.aib-net.org/facts/european-residual-mix

a life cycle analysis, the Norwegian Standard NS 3720:2018 “Method for greenhouse gas calculations for buildings” considers 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 a trajectory from the current grid factor to a close to zero emission factor in 2050 and steady until the end of the lifetime.

The mentioned standard calculates, on a life cycle basis, the average $CO_2$-factor for the next 60 years, a lifetime relevant for buildings and renewable energy assets, according to two scenarios as described in table 1.

*Table 1 Electricity production greenhouse gas factors ($CO_2$ equivalents) for two scenarios (source: NS 3020:2018, Table A.1)*

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

The impact calculations in this report apply the European mix in table 1. This is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[3].

Applying the factor based on EU27 + UK + Norway energy production mix, the resulting $CO_2$-factor for Norwegian residential buildings[4] is on average 111 $gCO_2e$/kWh due to the influx of bioenergy and district heating in the energy mix. This factor is used in impact calculations in section 2 and 3.

[3] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[4] Multiconsult. Based on building code assignments for DiBK

# 2 Energy efficient residential buildings

## 2.1 Eligibility criteria

Eligibility for existing residential buildings (built before January 1st 2021) in the Skue Sparebank portfolio is identified against criteria using historic building code development and data from the Energy Performance Certificate (EPC) system. The formulated criteria are in line with, or stricter than, the equivalent CBI's proxy criterion for Norwegian residential buildings. New buildings (built since January 1st 2021) are identified by utilising detailed information from the EPC data base and the national NZEB definition of January 2023.

The Skue Sparebank Green Bond Framework formulates the following criteria:

***New or existing residential buildings built in 2021 or later:***

i. Buildings with an energy consumption that is 10% lower than national minimum requirements (TEK17).

***Existing residential buildings built before 2021:***

i. Buildings with Energy Performance Certificate A; or

ii. Buildings within the top 15% of the national or regional stock in terms of primary energy demand, defined as buildings built according to Norwegian building codes of 2010 (TEK10) or 2017 (TEK17), however for buildings built prior to 2012, to have at least Energy Performance Certificate B; or

***Renovated buildings:***

i. Costs related to renovations leading to a reduction in primary energy demand of at least 30%.

ii. For the full building to qualify, it should after renovations be expected to meet the criteria above for buildings built either before or after 2021.

Multiconsult has studied the Norwegian residential building stock and presents in the following how Energy Performance Certificates and building code may be used to identify energy efficient buildings and eligible to the criteria above.

## 2.2 Residential buildings built in 2021 or later with deemed energy demand 10% lower than TEK17

The Skue Sparebank criterion for new or existing residential buildings built in 2021 or later was established before the national definition of nearly zero energy buildings (NZEB) was presented in January 2023. The criterion and the NZEB-definition are however comparable. The NZEB-definition is based on the TEK17 building code and when adjusting for technicalities in the definition and comparing it to deemed specific delivered energy demand available in the EPC database, the qualifying buildings may be identified. The national NZEB- definition specifies that a flat Primary Energy Factor of 1 (one) for all energy carriers are to be used. This enables the direct comparison of TEK and EPC for buildings built according to TEK17. The major difference between building code (TEK and the NZEB-definition) and the EPC system is that the latter certifies single apartments, while the building core refers to the whole building. To account for this difference, the area correction factoring are reversed in the EPC system to resemble the whole building and not a single apartment.

## 2.3 Residential buildings built before 2021 that comply with building code TEK10 or newer

Over several decades, the changes in the building code have pushed for more energy efficient buildings. Combining the information on the calculated energy demand related to building code and information on the residential building stock, the calculated average specific energy demand on the Norwegian residential building stock is 251 kWh/m². Building code TEK10 and TEK17 gives an average specific energy demand for existing houses and apartments, weighted for actual stock, of 114 kWh/m².

Hence, the building codes TEK10 and TEK17 give a calculated specific energy demand 54% lower than the average residential building stock. As of 2020, **12.4% of Norwegian residential buildings are built following TEK10** or a newer building code, well within 15% and thus being eligible according to the Skue Sparebank 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[5].

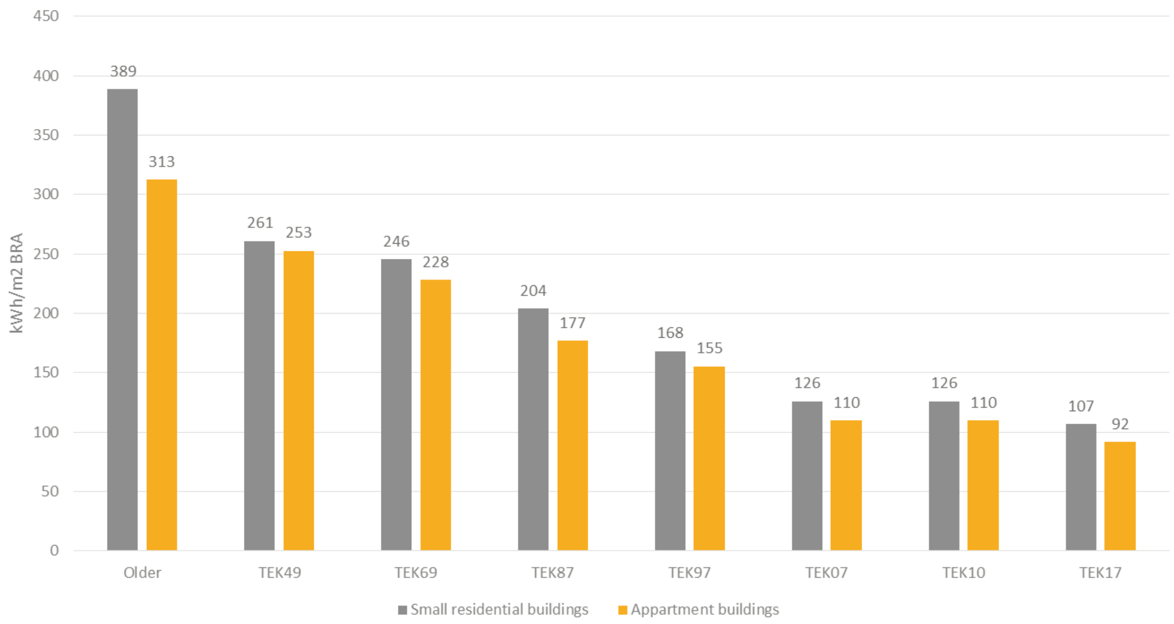


*Figure 2 Development in calculated specific net energy demand based on building code and building tradition, (Multiconsult, simulated in SIMIEN)*

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

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

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<br>Apartment buildings (model homes) | Specific energy demand<br>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.

### *2.3.1 Time lag between building permit and building period*

Following the implementation of a new 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.

Figure 3 below, based on statistics from Statistics Norway (SSB), indicates that a standard construction period for residential buildings lasts approximately six months to a year.

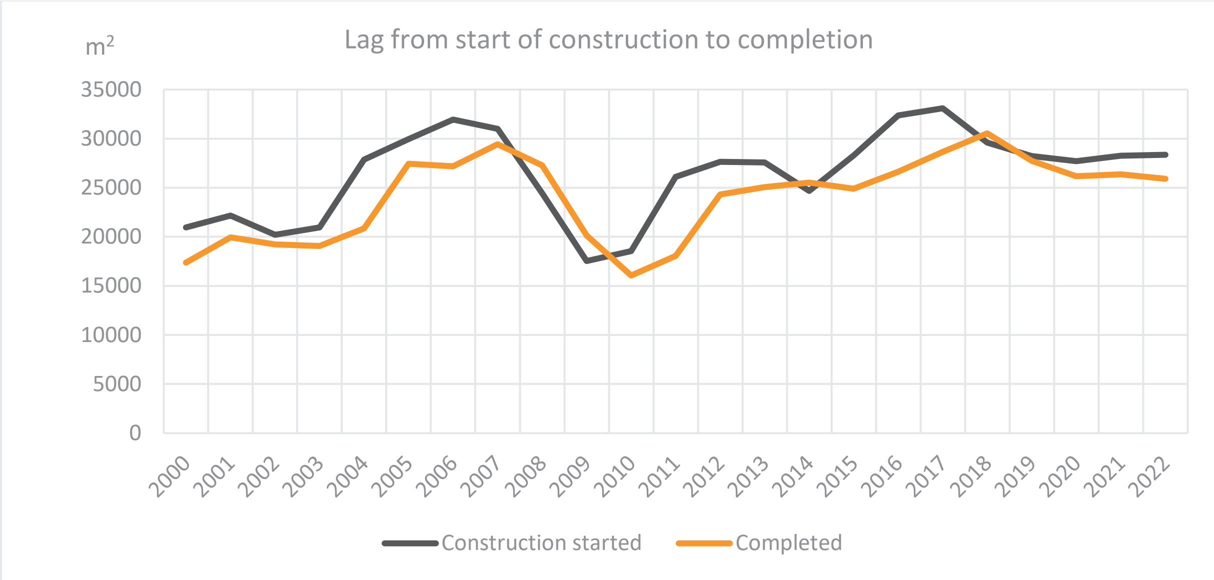


*Figure 3 Project start-up and completion (Statistics Norway, bygningsarealstatistikken)*

### 2.3.2 Building age statistics

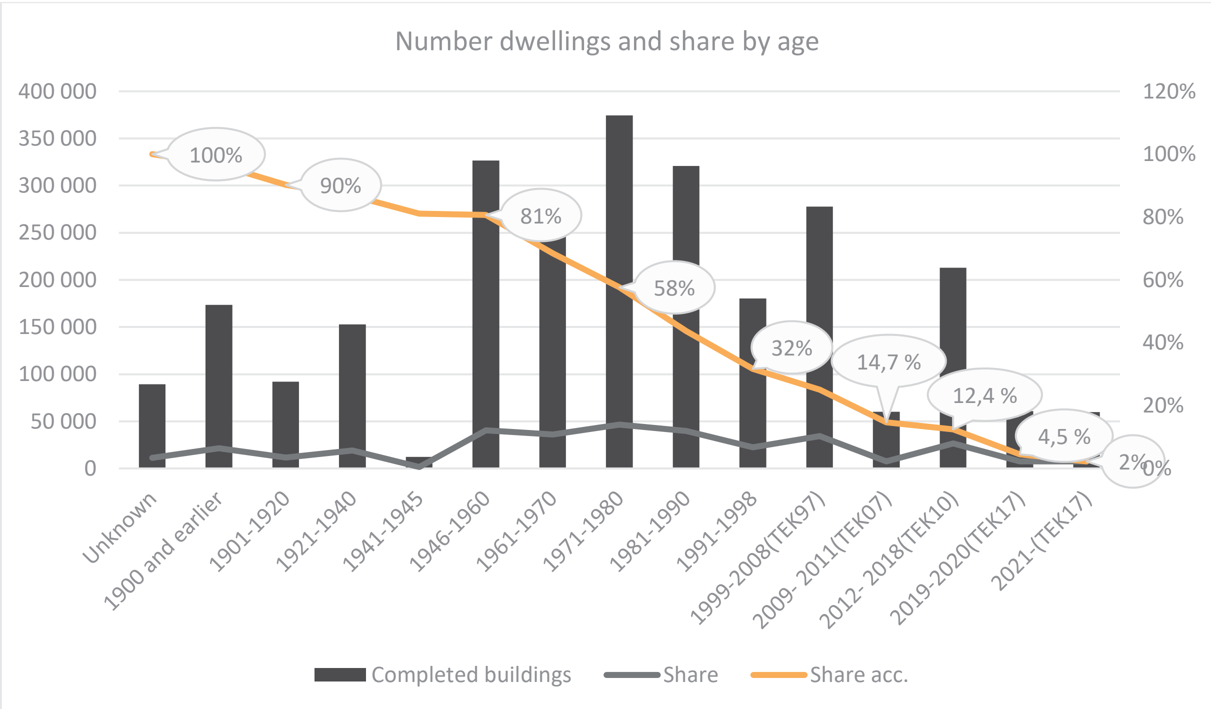


*Figure 4 Age and building code distribution of dwellings (Statistics Norway and Multiconsult)*

Figure 4 above shows how the Norwegian residential building stock is distributed by age and how buildings finished in 2012 or later (built according to TEK10 or TEK17) make up 12.4% of the total stock. Based on theoretical energy demand in the same building stock, those 12.4% of the stock stand for 4.7% of the energy demand in residential buildings (Figure 5) and 4.4% 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.

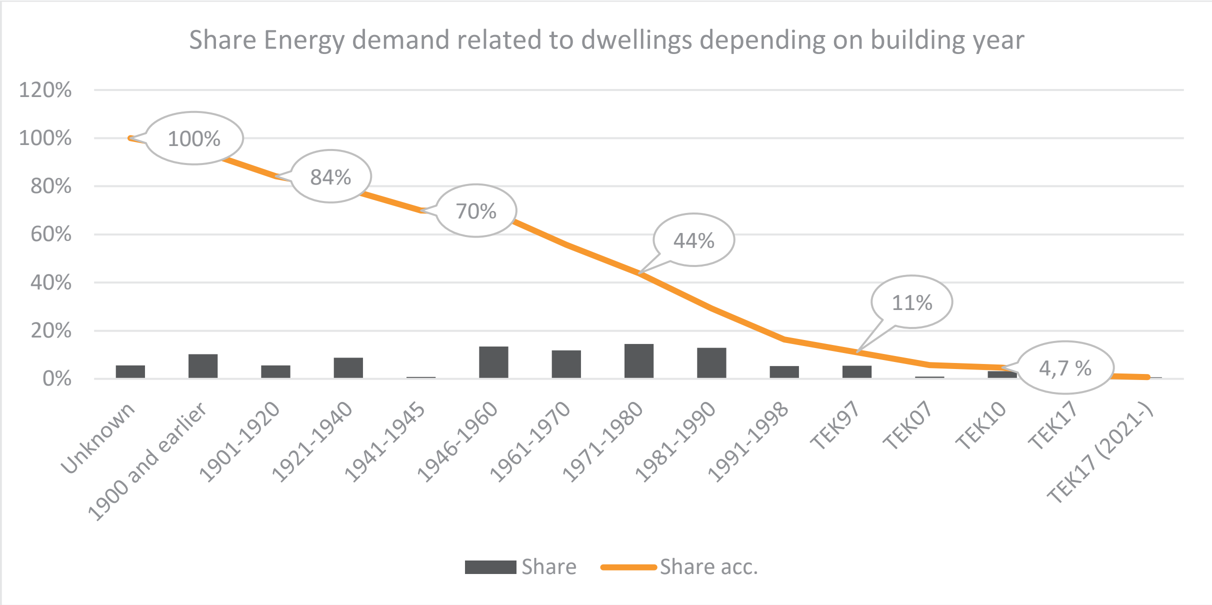


*Figure 5 The building stock's relative share of energy demand (Statistics Norway and Multiconsult)*

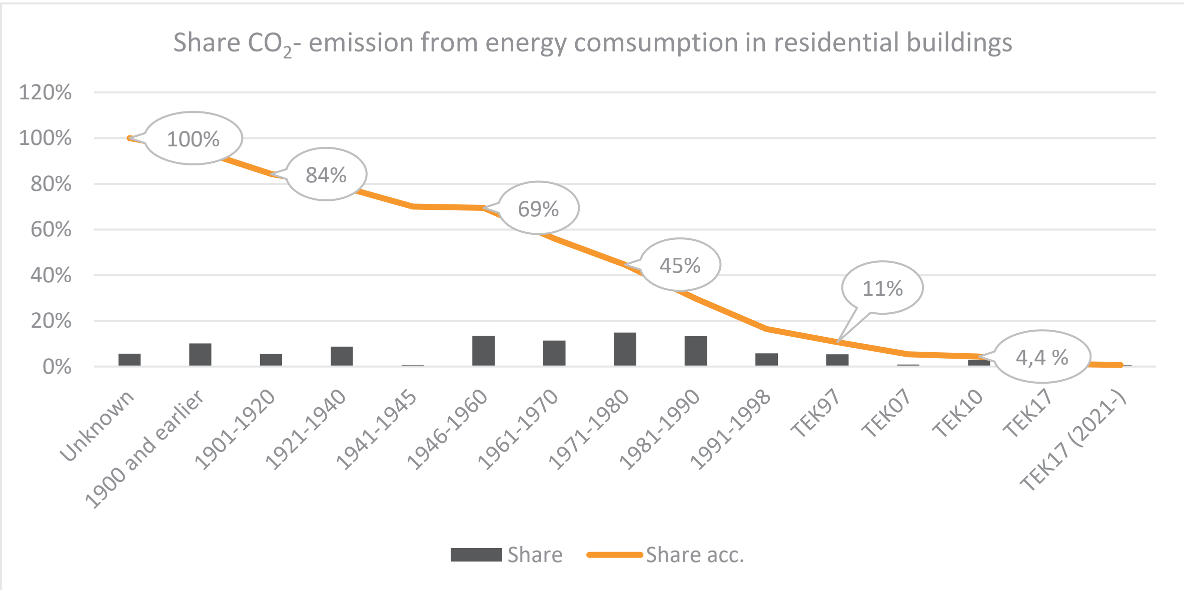


*Figure 6 The building stock's relative share of $CO_2$-emissions related to energy demand dependent on building year and code (Statistics Norway and Multiconsult)*

## 2.4 Norwegian residential buildings with Energy Performance Certificates (EPC)

### *2.4.1 Identification of energy efficient residential buildings through EPC labels*

The Energy Performance Certificate (EPC) system is another source for identifying energy efficient buildings. The Energy Certificate Performance System became operative in 2010 and made mandatory for all new residences completed after the 1st of July 2010 and all residences sold or rented out. 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 about 50%, and only a share of these labels is at the moment made available to the banks due to data quality issues.

### *2.4.2 EPC grading statistics*

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

Assuming registered EPCs are representative for the building stock completed in the time 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 7 illustrates how EPCs would be distributed based on this assumption. 8.4% of the residences would have a B or better.

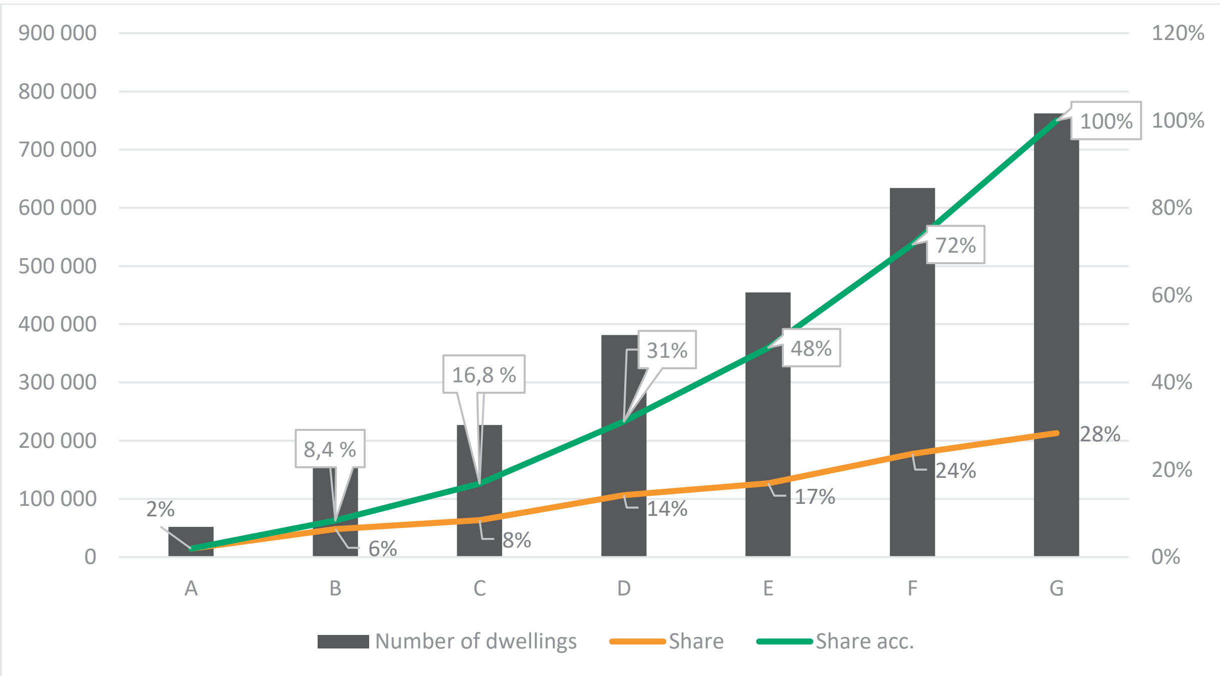


*Figure 7 EPCs extrapolated to include the whole residential building stock (Source: energimerking.no Jan23 and Statistics Norway Apr23, Multiconsult)*

## 2.5 Combination of criteria

The two criteria are based on different statistics. It is, however, interesting to view them in combination. Table 3 illustrates how the criteria, independently and in combination, make up cumulative %'s.

Interpretation: TEK10 and newer in isolation represents 12.4%; TEK10 and newer in combination with A+B labels represents 13.8%; TEK10 and newer in combination with A+B+C labels represents 18.1%.

| | TEK10+TEK17 | TEK07 small resi. | EPC A+B | EPC A+B+C |
|---|---|---|---|---|
| TEK10+TEK17 | 12.4 % | | 13,8 % | 18,1 % |
| TEK07 small resi. | | 14.7 % | 15,7 % | 19,0 % |
| EPC A+B | | | 8.4 % | |
| EPC A+B+C | | | | 16.8 % |

*Table 3 Matrix of Cumulative %'s for criteria combinations (FY22), relative to the total residential building stock in Norway*

## 2.6 Impact assessment - Residential buildings

The eligible residential buildings in Skue Sparebank's portfolio is estimated to amount to 75 thousand square meters. The available data include reliable area for most objects. For objects where this data is not available, the area per dwelling is calculated based on average area derived from national statistics (Statistics Norway[6]).

Eligibility for buildings from before 2021 is first checked against the EPC A criterion. The ones left are checked against the building code criterion, and finally buildings from before 2012 are checked against the EPC B criterion so no double counting of objects will occur. Buildings built in 2021 or later are only checked against the NZEB-10% criterion. The eligible residential buildings in Skue Sparebank's portfolio are estimated to amount to 75,445 square meters, whereas the major part, 489 objects, is eligible through the building code criterion. Of the 48 objects qualifying according to the EPC-criterion for existing buildings, 31 % are A's and the rest have energy label B. For the 20 new buildings qualifying against the NZEB-10% criterion, 40% have energy label A and the rest B.

*Table 4 Eligible residential objects*

| | Number of units qualifying buildings in portfolio | | | | | |
|---|---|---|---|---|---|---|
| | EPC A >= 2021 | EPC B >=2021 | EPC A <2021 | TEK17 <2021 | TEK10 <2021 | EPC B <2012 |
| Small residential buildings | 6 | 7 | 10 | 40 | 149 | 9 |
| Apartments | 2 | 5 | 5 | 70 | 230 | 24 |
| **Sum** | **8** | **12** | **15** | **110** | **379** | **33** |

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

*Table 5 Calculated area of qualifying buildings*

| | Area qualifying buildings in portfolio [m2] | | | | | | |
|---|---|---|---|---|---|---|---|
| | EPC A >= 2021 | EPC B >=2021 | EPC A <2021 | TEK17 <2021 | TEK10 <2021 | EPC B <2012 | Sum |
| Small residential buildings | 380 | 475 | 630 | 2,980 | 11,637 | 705 | **16,807** |
| Apartments | 227 | 855 | 1,150 | 11,035 | 39,756 | 5,615 | **58,638** |
| **Sum** | **607** | **1,330** | **1,780** | **14,015** | **51,393** | **6,320** | **75,445** |

To calculate the impact on climate gas emissions, the trajectory is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bioenergy and district heating, resulting in a total specific emission factor of 111 $gCO_2e/kWh$. A proportional relationship is expected between energy consumption and emissions.

Table 6 below indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock, both expressed as a total and as a share defined by the bank's share of financing. It also presents how much the calculated reduction in energy demand constitutes in $CO_2$-emissions.

*Table 6 Performance of eligible residential objects compared to average building stock*

| | Avoided energy demand compared to baseline | Avoided $CO_2$-emissions compared to baseline |
|---|---|---|
| Eligible buildings in portfolio | **10 GWh/year** | **1,083 tons CO2e/year** |
| Scaled by engagement | **5 GWh/year** | **576 tons CO2e/year** |

# 3 Energy efficient commercial buildings

## 3.1 Eligibility criteria

Skue Sparebank's Green Loan Criteria for commercial buildings are identical to the residential buildings criteria:

***New or existing buildings built in 2021 or later:***

ii. Buildings with an energy consumption that is 10% lower than national minimum requirements (TEK17).

***Existing buildings built before 2021:***

iii. Buildings with Energy Performance Certificate A; or

iv. Buildings within the top 15% of the national or regional stock in terms of primary energy demand, defined as buildings built according to Norwegian building codes of 2010 (TEK10) or 2017 (TEK17), however for buildings built prior to 2012, to have at least Energy Performance Certificate B; or

***Renovated buildings:***

iii. Costs related to renovations leading to a reduction in primary energy demand of at least 30%.

iv. For the full building to qualify, it should after renovations be expected to meet the criteria above for buildings built either before or after 2021.

As for residential buildings, the criterion for new or existing residential buildings built in 2021 or later is comparable to the NZEB-definition of January 2023.

To identify qualifying existing buildings, EPC labels are available from the EPC database. Furthermore has the building code criterion been translated to unique criteria for four subcategories: office buildings, retail, hotel and restaurant buildings and industry/warehouses. For hotel and restaurant buildings a three-year lag between implementation of a new building code and the buildings built under that code must be taken into account. Hence hotel buildings finished in 2013 or later qualify. For the other subcategories, the corresponding lag is two years. Hence buildings finished in 2012 or later qualify.

Combining the information on the calculated specific energy demand related to building code and information on the building stock, the average specific energy demand is presented in the table below. The table presents the average specific energy demand for the qualifying part of the building stock and the relative reduction in energy demand.

*Table 7 Specific energy demand for the building stock, part eligible according to criteria and reduction*

| | Average total stock [kWh/m$^2$] | Average TEK10 and TEK17 [kWh/m$^2$] | Reduction [%] |
|---|---|---|---|
| Office buildings | 246 | 139 | 43 % |
| Retail buildings | 318 | 201 | 37 % |
| Hotel and restaurant buildings | 327 | 209 | 36 % |
| Small industry and warehouses | 285 | 160 | 44 % |

## 3.2 Impact assessment - Commercial buildings

The eligible buildings in Skue Sparebank's commercial portfolio is estimated to amount to 6,821 square meters. 29 objects are found eligible according to a building code criterion. 1 of the 3 buildings identified as eligible according to an EPC-criterion only, have the energy label A. The buildings qualifying according to two criteria are only counted once.

The difference between average specific energy demand for each sub-category 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. For the buildings qualifying according to the EPC-criterion only, the calculations are based on the difference between achieved energy label and weighted average in the EPC database. For the buildings qualifying according to the refurbishment criterion only, the calculations are based on the difference between energy demand for achieved energy label and the energy label based on building year.

*Table 8 Calculated building areas for eligible commercial objects*

| | Area qualifying buildings in portfolio [m$^2$] | | | | | | |
|---|---|---|---|---|---|---|---|
| | EPC A >= 2021 | EPC B >=2021 | EPC A <2021 | TEK17 <2021 | TEK10 <2021 | EPC B <2012 | **Sum** |
| Retail/commercial buildings | | | | 1,305 | 707 | 95 | **2,107** |
| Hotels and restaurants | | | | | 155 | | **155** |
| Small industry and warehouses | | | | 1,647 | 2,787 | | **4,434** |
| Office buildings | | | 95 | 1,709 | 2,937 | 45 | **4,786** |
| **Sum** | | | **95** | **4,661** | **6,586** | **140** | **11,482** |

The table below indicates how much more energy efficient the eligible part of the portfolio is compared to the average Norwegian commercial building stock. It also presents how much the calculated reduction in energy demand constitutes in $CO_2$-emissions.

*Table 9 Performance of commercial eligible objects compared to average building stock*

| | Avoided energy demand compared to baseline | Avoided $CO_2$-emissions compared to baseline |
|---|---|---|
| Eligible buildings in portfolio | **1.3 GWh/year** | **148 tons $CO_2$e/year** |
| Scaled by engagement | **0.6 GWh/year** | **69 tons $CO_2$e/year** |

# 4 Renewable energy

Hydropower has played a significant role in Norway's power production since the industrial revolution. Today, hydropower remains a crucial component of the national energy mix, accounting for 88% of the national electricity production in 2022[7]. The same year, onshore wind accounted for 10% of the national power production.

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. Licenses grant rights to build and run 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 different requirements on different kind of projects[8].

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

## 4.1 Eligibility

The main eligibility criteria are in line with the CBI criteria and the EU Taxonomy. 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, Norwegian reservoirs are not exposed to significant cyclic revegetation of impoundment and hence the negative impacts on GHG emissions from these reservoirs are very small.

Hydropower plants and installations, as well relating technologies, equipment and infrastructure qualify if they have;

i. a power density above 5W/$m^2$ (ratio between capacity and impounded area),

ii. life-cycle emissions below 100 g$CO_2$e/kWh, or

iii. are run-of-river plants without artificial reservoirs

Climate Bonds Initiative (CBI) have published hydropower eligibility criteria[9]. These criteria have a mitigation component and an adaptation and resilience component.

The mitigation component for existing plants requires power density > 5 W/$m^2$ or emission intensity < 100 g$CO_2$e/kWh. (For new/under construction the thresholds are 10 W/$m^2$ and 50 g$CO_2$e/kWh).

The adaptation and resilience component, addressing ESG, is in the Norwegian context covered by the rigid relevant requirements in the Norwegian regulation of hydropower.

The eligibility criteria mentioned above are central also in the EU taxonomy. Most *do no significant harm* (DNSH) requirements are covered by current national regulation of hydropower, however, with exemptions. Portfolio alignment with DNSH requirements has not been assessed.

[7] https://www.ssb.no/energi-og-industri/energi/statistikk/elektrisitet/artikler/betydelig-nedgang-i-stromforbruket-i-2022
[8] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[9] https://www.climatebonds.net/files/files/Hydropower-Criteria-doc-March-2021-release3.pdf

## 4.2 Eligible assets in portfolio

Skue Sparebank's eligible assets have low to negligible GHG emission related to construction and operation of the renewable power plants, something Multiconsult can verify.

All power produced by renewable energy power stations in Skue Sparebank's portfolio is from hydropower stations with capacities in the range of 0.8-3.4 MW. These are run-of-river plants and hence have higher power density of several thousand $W/m^2$.

## 4.3 Impact assessment - Renewable energy

### *4.3.1 $CO_2$-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 across the Skue Sparebank portfolio, with most of the facilities being in rather small scale, 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), referred to by NVE[10], uses an emission factor of 6 gCO2e/kWh for all European hydropower in their calculations of the European residual mix. The value is based on a life cycle analysis (LCA) 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 the factors are reported higher than in other credible sources. For instance, Østfoldforskning calculated the average GHG emission intensity of Norwegian hydropower, across all categories using LCA, to be 3.33 $gCO_2e/kWh$[11].

Skue Sparebank portfolio contains several run-of-river hydropower assets, and the AIB emission factor is therefore regarded as conservative in an impact assessment setting. The positive impact of the hydropower assets is 130 $gCO_2e/kWh$, compared to the baseline of 136 $gCO_2e/kWh$.

### *4.3.2 Power production estimates*

Actual and planned power production has verified by Multiconsult using the NVE's hydropower database.

It is to note that indicated power production capacity in the concession documents do not necessarily represent what can realistically be expected from the plant over time. For one the hydrology is uncertain, and unfortunately often overestimated in early project phases. Also, 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 claim the same mismatch for large hydropower.

[10] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/
[11] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf

### *4.3.3 Portfolio analysis - New or existing Norwegian renewable energy plants*

The eligible plants in Skue Sparebank's portfolio are expected to have the capacity to produce about 9.3 GWh per year, scaled to the banks engagement. The available data from the bank and open sources include:

- Type of plant (run-of-river/reservoir)
- Installed capacity
- Estimated or recorded production
- Age

To cross-check the data, the planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's hydropower database[12] or licencing documents. Table 10 describes the hydropower plants identified in the mentioned database. The production volume is scaled by the banks share of financing, ranging from 22 to 100%.

Due to the often overestimated annual production in small hydropower, the impact is conservatively calculated for estimated production reduced by 20%.

*Table 10 Capacity and annual production of eligible hydropower plants, estimated and expected production*

| | Capacity [MW] | # of plants | Total capacity [MW] | Estimated production NVE [GWh/yr] | Expected production [GWh/yr] |
|---|---|---|---|---|---|
| Small run-of-river | 0.8 - 3.4 | 6 | 10.9 | 29.1 | 23.3 |

Table 11 below summarises the renewable energy produced by the eligible assets in the portfolio in an average year, and the avoided $CO_2$-emissions the energy production results in.

*Table 11 Annual power production and estimated positive impact on GHG-emissions in total and scaled by the bank's share of financing*

| | Expected produced power [GWh/year] | Reduced $CO_2$-emissions compared to baseline [tonnes CO2e/year] |
|---|---|---|
| Identified eligible renewable energy plants in portfolio | **23.3** | **3,026** |
| Identified eligible renewable energy plants in portfolio scaled by bank's share of financing | **9.3** | **1,215** |

[12] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/