Report

SpareBank 1 SMN Green Portfolio Impact Assessment FY2024

CLIENT

SpareBank 1 SMN

SUBJECT

Impact assessment – energy efficient residential and commercial buildings, electric vehicles and renewable energy

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Report

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SUMMARY

In summary, the impact for the examined asset classes in the SpareBank 1 SMN portfolio qualifying according to green bond criteria is dominated by energy efficient residential buildings, but with significant contributions from all asset classes. The following table sums up the impact in rounded numbers:

Energy efficient residential buildings	*17,120 tonnes CO2-eq/year*
Energy efficient commercial buildings	*6,430 tonnes CO2-eq/year*
Electric vehicles	*7,020 tonnes CO2-eq/year*
Renewable energy	*4,380 tonnes CO2-eq/year*
Total	***34,950 tonnes CO2-eq/year***

Note that the impact is not scaled by the bank's engagement.

Note also that for electric vehicles, the scaled impact above is the sum of 9,910 tonnes CO2-eq/year Scope 1 emissions, and -2,890 CO2-eq/year in Scope 2 emissions based on European power mix.

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1 Introduction

On assignment from SpareBank 1 SMN (SMN), Multiconsult has assessed the impact of SMN's loan portfolio eligible for green bonds according to SMN's Green Bonds Framework.

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

1.1 Electricity demand and production

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

Renewables account for approximately 99 percent of the total Norwegian electricity production, the final percentage being thermal power production from natural gas, biomass, and waste heat[2]. Figure 1-1, which is based on numbers from the Association of Issuing Bodies, shows that the Norwegian production mix in 2023 resulted in emissions of 0 gCO_2/kWh. In the figure, the production mix is included for other selected European states for comparison.

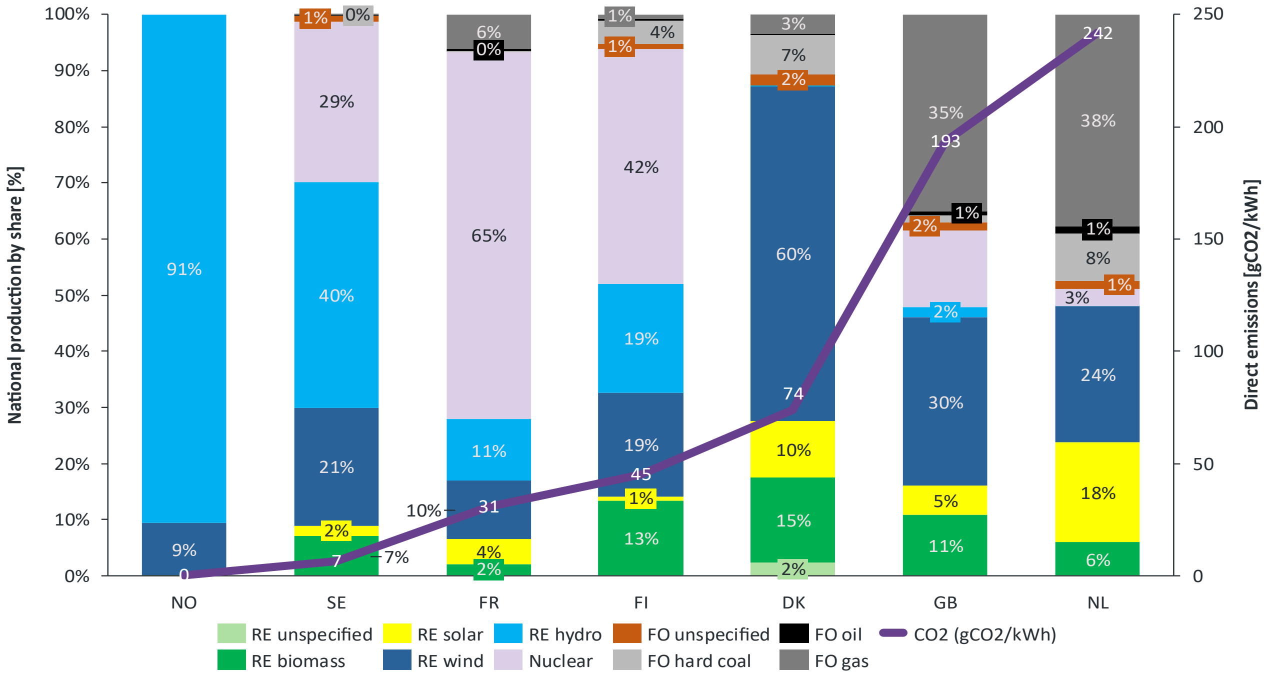

Figure 1-1 National electricity production mix in some selected countries (Source: European Residual Mixes 2023, Association of Issuing Bodies[3]).

[1] https://www.sparebank1.no/nb/smn/om-oss/barekraft/rammeverk-for-gronne-obligasjoner.html
[2] Statistic Norway Table 08307: Production, imports, exports and consumption of electric energy: https://www.ssb.no/en/statbank/table/08307
[3] https://www.aib-net.org/facts/european-residual-mix, 2024

As Figure 1-1 shows, emissions from power production vary between countries. Due to the interconnection of the power grid, the placement of the system boundary for power production heavily influences the greenhouse gas (GHG) emission factor associated with said production. To demonstrate how the choice of system boundary between Norway only or Europe as a whole and type of emission factor influence the results, the impact assessments are here presented based on several emission factors.

1.2 Emission factors for energy efficient buildings

The CO_2 emissions resulting from energy demand in residential buildings depend to a large degree on building age. This is due to two factors: 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. Since the financed qualifying 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 CO_2 emissions in their lifetime. The main grid factor used in this green portfolio impact assessment reflects an average in the buildings lifetime, assuming a decarbonisation in the European energy system.

Finans Norge released a guidance document for calculation of financed GHG emissions in 2023, including recommendations for grid factors to be used[4]. To demonstrate how emissions vary depending on grid factor, the two recommended grid factors from The Norwegian Water Resources and Energy Directorate (NVE) are included. That is, the most recent Norwegian physically delivered electricity for 2023[5] and the Norwegian residual mix for 2023[6]. The Norwegian residual mix is calculated by the Association of Issuing Bodies, which is the organization responsible for developing and promoting the European Energy Certificate System (EECS)[7].

The grid factors are summarized in Table 1-1 below and described in more detail in the following sub-sections.

To calculate the impact on climate gas emissions, the grid factors are applied to all electricity consumption in the residential buildings in the portfolio eligible for green bonds. 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 1-1.

[4] https://www.finansnorge.no/dokumenter/maler-og-veiledere/veileder-for-beregning-av-finansierte-klimagassutslipp/, 2024
[5] https://www.nve.no/energi/energisystem/kraftproduksjon/hvor-kommer-stroemmen-fra/, 2024
[6] https://www.aib-net.org/facts/european-residual-mix/2023, 2024
[7] https://www.aib-net.org/, 2024

Table 1-1 Electricity production GHG factors (CO2-eq) with and without influx of other heating sources for buildings in three scenarios. (Source: NS 3720:2018, Table A. 1, NVE[5], AIB[6])

Scenario	Description	Emission factor electricity [gCO_2/kWh]	Emission factor incl. other heating sources [gCO_2/kWh][8]
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
Norwegian NVE physically delivered electricity 2023	Location-based production mix with narrow system boundary of Norway only but including net export/ import only to neighbouring countries and average annual emission factors	15	15
Norwegian NVE residual mix 2023	Market-based residual mix for Norway with a European marketplace	599	495

1.2.1 European (EU27+ UK+ Norway) and Norwegian electricity mix over building's lifetime

Using a life-cycle analysis (LCA), the Norwegian Standard NS 3720:2018 "Method for greenhouse gas calculations for buildings" considers international trade of electricity and the fact that consumption and grid factor does not necessarily mirror domestic production. The grid factor, as average in the lifetime of an asset, is based on a linear trajectory from the current grid factor to a close to zero emission factor in 2050 and steady until the end of the lifetime. This factor is location-based.

The mentioned standard calculates, on a life-cycle basis, the average emission factor for the next 60 years according to a European (EU27+ UK+ Norway) system boundary, as described in Table 1-1.

Norway is part of a larger, integrated European power grid, and import and export of electricity throughout the year means not all electricity consumed in Norway is produced here. The standard also calculates the equivalent Norway only emission factor. Using the European mix instead of the Norway only mix, is then a more conservative approach.

The European electricity factor is 136 gCO2-eq/kWh, which constitutes the GHG emission intensity baseline for energy use in buildings with a life span of 50-60 years and assuming that the CO_2 emission factor of the European power production mix is close to zero by 2050. This value is comparable to the equivalent determined in Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (January 2020).

1.2.2 Norwegian physically delivered electricity 2023

NVE calculates a climate declaration for physically delivered electricity for the previous year[9]. This factor represents electricity consumed in Norway, accounting for emissions from net import and export of electricity from neighbouring countries and these countries' average annual emission factors. The most recent grid factor is 15 gCO2-eq/kWh for 2023[9].

[8] Multiconsult. Based on building code assignments for DiBK, 2015.
[9] https://www.nve.no/energi/energisystem/kraftproduksjon/hvor-kommer-stroemmen-fra/, 2024

1.2.3 Norwegian residual mix 2023

Certificates of origin, direct power purchase agreements or other documentation of which power has been purchased for the buildings in the portfolio, are not available to the bank. There is also no basis for making assumptions on the share of the energy consumed by the buildings in the portfolio that has been purchased with Guarantees of Origin. An alternative market-based grid factor for Norway is then the electricity disclosure published by NVE[10] and Association of Issuing Bodies[11]. This is the electricity residual mix of the country, which shows the sources of the electricity supply that is not covered with Guarantees of Origin, considering a European marketplace for electricity. Guarantees of Origin are not very widespread in the Norwegian electricity end-user market, resulting in a high emission factor of 599 gCO2-eq/kWh for 2023[11].

1.3 Emission factors for zero-emission vehicles

The GHG emission intensity baseline for power consumption may be calculated with different system boundaries. For electric vehicles (EVs), a three-year average emission factor for power production in Europe is applied. Yearly power production mix and related CO_2 emissions as calculated by the Association of Issuing Bodies[11] are included for all European countries excluding Iceland, Cyprus, Ukraine, Russia and Moldova.

Similar to the European NS 3720:2018 electricity mixes for buildings, the average emission factor relevant for electric vehicles is also calculated based on a trajectory from the current grid factor to a close to zero emission factor in 2050. However, while a life-cycle based factor is used for buildings, a factor based on European (EU27+UK+Norway) electricity production mixes for recent years is applied to represent the location-based production mix with wide system boundaries.

Considering the emission trajectory and lifetime of the vehicles, the electricity factor for passenger vehicles is 159 gCO2-eq/kWh. In addition, the factors for Norwegian NVE physically delivered electricity and residual mixes for 2023 presented in the previous subsection are applied. Relevant indirect emission factors per distance [gCO_2/km] are calculated based on these and used in the EV analysis. See more detail in subsection 4.3.

1.4 Emission factors for renewable energy production

For renewable energy, the impact calculations use the electricity emission factors from Table 1-1 as baselines. The difference between the renewable energy and the grid electricity emissions is considered the avoided emissions per produced unit of electricity. The location-based mix for Europe have been used in previous analyses, and the location-based and market-based mixes for Norway are introduced for comparison. The resulting factors are described more in subsection 5.3.1.

[10] https://www.nve.no/energy-supply/electricity-disclosure/?ref=mainmenu, 2024
[11] https://www.aib-net.org/facts/european-residual-mix/2023, 2024

2 Energy efficient residential buildings

2.1 Eligibility criteria

Eligibility in this impact assessment for residential buildings in the SpareBank 1 SMN portfolio is identified against a building code criterion and an EPC criterion as formulated below. These criteria are in accordance with the EU Taxonomy Climate Delegated Act.

The dataset provided by SpareBank 1 SMN contains the following data for each object:

- Building category,
- area,
- year of construction,
- EPC energy label.

2.1.1 Buildings built in 2021 or later: NZEB-10%

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 require 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).

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 on the Norwegian NZEB definition. The Norwegian national definition of NZEB was published in January 2023[12] with a correction issued in January 2024[13].

All residential buildings completed after 31 December 2020 with an EPC label A qualify according to the NZEB-10 percent criterion. Residential buildings with an EPC label B may also qualify, depending on energy demand.

2.1.2 Buildings built before 2021: EPC A label or within the top 15% low-carbon buildings in Norway

Existing Norwegian residential buildings with EPC labels A or B and Norwegian residential buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes are eligible for green bonds. All these buildings have significantly better energy standards and account for less than 15 percent of the residential building stock built before 2021. A two-year lag between the implementation of a new building code and the buildings built under that code must be taken into account.

Figure illustrates how the criteria, in combination, make up cumulative percentages of the total residential building stock built before 2021 in Norway. Buildings with EPC A represent 1.1 percent; Buildings with EPC A and EPC B represent 7 percent; Buildings with EPC A and EPC B and buildings that comply with TEK17 represent 7.8 percent. TEK10 and newer in combination with A+B labels represent 11.9 percent; EPC A+B+C labels represent 15.2 percent of the total residential building stock built

[12] https://www.regjeringen.no/no/aktuelt/taksonomien-maler-for-rapportering-og-retting-av-veiledning-om-primarenergifaktorer/id3021759
[13] https://www.regjeringen.no/no/aktuelt/rettleiing-om-utrekning-av-primarenergibehov-i-bygningar-og-energirammer-for-nesten-nullenergibygningar/id2961158

before 2021 in Norway. The calculation precludes double counting – each building is only counted once in the analysis.

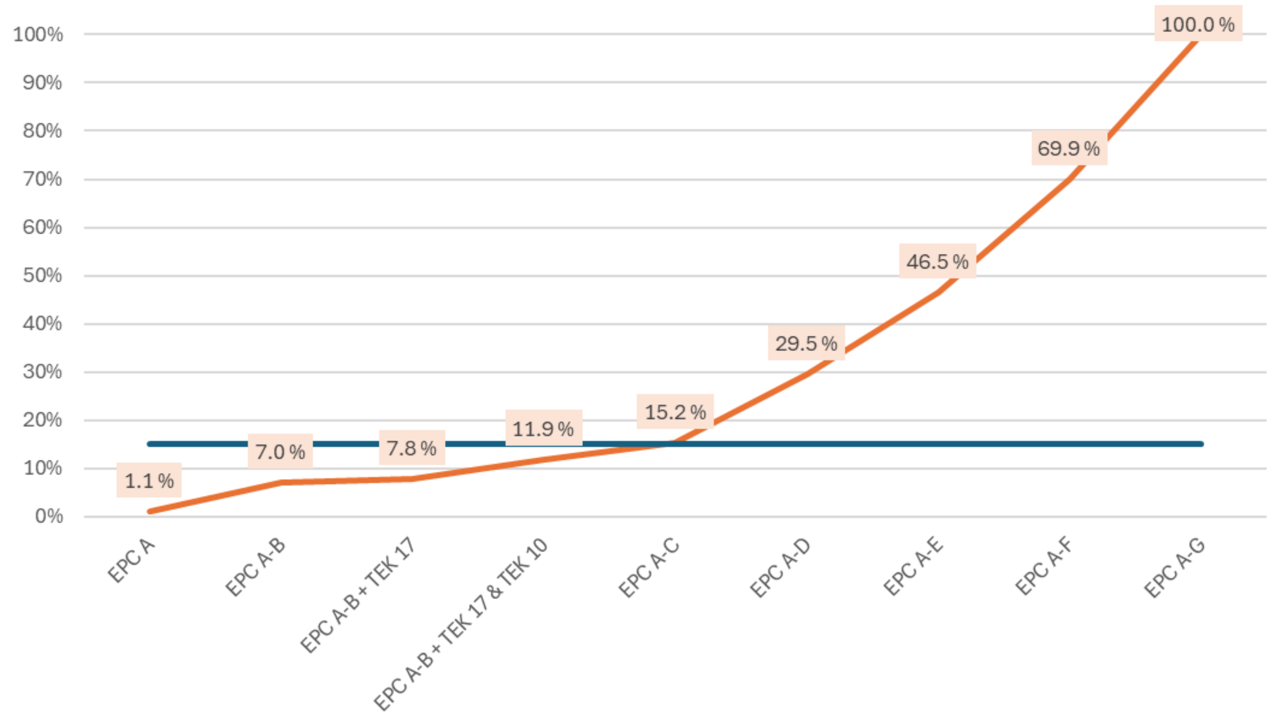

Figure 2-1 Cumulative percentages for criteria combinations, relative to the total residential building stock built before 2021 in Norway

Previously, TEK07 small residential buildings were included in the top 15 percent and thus the green bond eligibility criteria of the bank. The bank is no longer including TEK07 buildings in the portfolio in the green pool that were originated post 31/12/2020 Loans originated before this date are grandfathered.

Previously, buildings with EPC C were included in the top 15 percent and thus the green bond eligibility criteria of the bank. The bank is no longer including EPC C label buildings in the portfolio in the green pool that were originated post 31/12/2020. Loans originated before this date are grandfathered.

2.2 Impact assessment – Residential buildings

Over the past several decades, changes in the building code have promoted more energy-efficient buildings. By combining data on calculated energy demand based on building code requirements with information on the residential building stock, the average specific energy demand is estimated at 257 kWh/m^2 for small residential buildings and 200 kWh/m^2 for apartments. These figures are used as the baseline in the impact calculations.

For the buildings qualifying according to the NZEB-10 percent criterion, the reduction is calculated based on the difference between the calculated specific energy usage of each unit and the baseline.

For the buildings qualifying according to the EPC criterion, the reduction is calculated based on the difference between the energy demand for the achieved energy label and the baseline.

For the buildings qualifying according to the building code criterion, the reduction is calculated based on the difference between the energy demand for the building code and the baseline.

The eligible residential buildings in SpareBank 1 SMN's portfolio are estimated to amount to 1.2 million square meters. The available data includes reliable areas for most objects. For objects where this data is not available, the area per dwelling is calculated based on the average area derived from national statistics[14].

Eligibility is first checked against the NZEB-10 percent criterion for buildings built in 2021 or later. Buildings from 2020 and older are checked against the top 15 percent criterion. An object is only qualified based on the first criterion it fulfils, hence no double counting of objects will occur.

The majority of the 8,893 objects are eligible through the top 15 percent criterion. 97 percent are eligible under the top 15 percent criterion and three percent are eligible under the NZEB-10 percent criterion.

Table 2-1 Eligible residential objects in the SpareBank 1 SMN portfolio.

	No. of units of eligible buildings in the portfolio						
	NZEB-10% EPC A	Top 15 % EPC A	Top 15 % EPC B	Top 15 % EPC C	Top 15 % TEK 17	Top 15 % TEK 10	Top 15 % TEK 07
Apartments	226	128	104	67	979	2,802	-
Small residential buildings	50	127	467	102	685	2,919	237
Sum	**276**	**255**	**571**	**169**	**1,664**	**5,721**	**237**

Table 2-2 Calculated area of qualifying buildings.

	Area of eligible buildings in the portfolio						
	NZEB-10% EPC A	Top 15 % EPC A	Top 15 % EPC B	Top 15 % EPC C	Top 15 % TEK 17	Top 15 % TEK 10	Top 15 % TEK 07
Apartments	14,709	9,475	9,043	5,453	74,627	220,542	-
Small residential buildings	10,009	29,294	102,130	19,274	124,108	532,804	45,557
Sum	**24,718**	**38,769**	**111,173**	**24,727**	**198,735**	**753,346**	**45,557**

Based on the calculated figures in Table 2-1 and Table 2-2, the energy efficiency of this part of the portfolio is estimated as described earlier. All these residential buildings are not necessarily included in one single bond issuance.

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 in Norwegian buildings, but the energy mix also includes bioenergy and district heating. Emission factors considering other heating sources in Table 1-1 are used in the calculations.

[14] Statistic Norway Table 06513: Dwellings, by type of building and utility floor space: https://www.ssb.no/en/statbank/table/06513

Table 2-3 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 how much the calculated reduction in energy demand constitutes in CO2 emissions.

Table 2-3 Performance of eligible residential objects compared to the average building stock.

	Avoided energy demand compared to baseline [GWh/year]	**Avoided CO2 emissions compared to baseline [tonnes CO2-eq/year]**		
		European (EU27+ UK+ Norway) NS 3720:2018 electricity mix	Norwegian physically delivered electricity 2023	Norwegian residual mix 2023
Eligible buildings in the portfolio	149	17,116	2,308	73,734

3 Commercial buildings

3.1.1 Eligibility criteria

According to SpareBank 1 SMN's Green Finance Framework, commercial buildings in Norway qualify for green bonds if they meet one of the following criteria:

i. ***Buildings built in 2021 or later: NZEB-10 percent***

Commercial buildings complying with the relevant NZEB-10 percent threshold.

ii. ***Buildings built before 2021: EPC A label or within the top 15 percent low carbon buildings in Norway***

Commercial buildings with EPC labels A or B or complying with building code TEK10 and later codes.

iii. ***Buildings which received at least one or more of the following classifications***

- LEED "Gold"
- BREEAM or BREEAM-NOR "Excellent", or equivalent or higher level of certification

The eligible commercial buildings in SpareBank 1 SMN's portfolio have been qualified by the bank based on building codes (TEK10/TEK17).

3.1.2 Energy efficiency

Combining the information on the calculated specific energy demand related to building code and information on the commercial building stock, the calculated average specific energy demand of the Norwegian commercial building stock (baseline) is presented in Table 3-1 below. The table also presents the average specific energy demand for the younger and qualifying part of the building stock (TEK10/TEK17) and the relative reduction in energy demand.

Table 3-1 Average specific energy demand for the building stock; whole stock and part eligible according to criteria and reduction. (Source: SSB, historic building codes, Multiconsult)

Building category	Average total stock (baseline) [kWh/m^2]	Average TEK10 and TEK17 [kWh/m^2]	Reduction
Office buildings	244	133	46 percent
Retail/commercial buildings	315	195	38 percent
Hotel and restaurant buildings	320	195	39 percent
Industry and small warehouse buildings	278	158	43 percent

3.1.3 Impact assessment – Commercial buildings

The green commercial buildings portfolio amounts to 473,475 square meters. It is to be noted that the commercial buildings portfolio of SpareBank 1 SMN includes some residential buildings as well. The impact related to these residential buildings are presented here, and not in the previous section to avoid mixing impact related to covered bonds (residential buildings) senior bond issuances.

The bank has provided specific data on the commercial buildings, including area and building category. Where a building falls into several categories, the total area is distributed between the categories. Table 3-2 indicates the area of each building category providing a basis for the following impact assessments.

Table 3-2 Eligible commercial buildings and calculated building areas.

Building category	Area qualifying buildings in portfolio [m^2]
Office buildings	125,865
Retail/commercial buildings	154,522
Hotel and restaurant buildings	22,387
Industry and small warehouse buildings	170,701
Sum	**473,475**

Similarly to impact calculations for residential buildings, impact for the commercial buildings qualifying on building code is calculated by first estimating the reduction in energy demand from the average of the total commercial building stock (baseline) to the average for eligible building codes (TEK10/TEK17), cf Table 3-1. This reduction is then multiplied by the area of eligible assets in Table 3-2 and emission factors in Table 1-1. A proportional relationship is expected between energy consumption and emissions:

$$Impact = \sum_i \left(E_i^B - E_i^{TEK}\right) A_i F k$$

where E_i^B = baseline energy demand (kWh/m^2), E_i^{TEK} = average TEK10/TEK17 energy demand (kWh/m^2), A_i =area (m^2), F = emission factor (gCO_2/kWh), k = 10^{-6} and i = building category.

Table 3-3 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 3-3 Avoided energy demand and emissions (CO2-eq) of eligible objects in the portfolio compared to average commercial building stock using three emission factors. (Source: public statistics, Statistics Norway, Multiconsult)

	Avoided energy demand compared to baseline [GWh/year]	Avoided emissions compared to baseline [tons CO2-eq/year]		
		European electricity mix	Norwegian location-based production mix	Norwegian market-based residual mix
Eligible commercial buildings in portfolio	56	6,426	867	27,684

4 Electric Vehicles

Multiconsult has assessed the direct and indirect impact of electric vehicles (EVs) in SpareBank 1 SMN's portfolio. The bank has provided the necessary data on the number of electric vehicles in their portfolio and portfolio volume, including the type of engine, fuel, and vehicle category, for their vehicles registered in Norway. SpareBank 1 SMN's vehicle portfolio contained 11,114 EVs as of the end of 2024. For more information related to the eligibility criteria, we refer to the bank's website[15].

The identified eligible vehicles in the portfolio also align with the technical eligibility criteria formulated in the Climate Bonds Standard[16] and in the EU Taxonomy[17].

The bank's portfolio is assessed regarding direct emissions (Scope 1) and indirect emissions related to electric power production (Scope 2). A baseline is established as the emission of the average new vehicles introduced to the market, EVs excluded.

4.1 Eligibility criteria

The green loan portfolio of SpareBank 1 SMN consists of electric vehicles that meet the eligibility criteria as formulated below:

- Fully electric, hydrogen or otherwise zero-emission vehicles for the transportation of passengers or freight

4.2 EV policies and regulations

This chapter summarises trends in personal mobility, EV and biofuel policy in Norway relevant for the subsequent Scope 1 and Scope 2 assessments.

4.2.1 Personal mobility and the car fleet in Norway and Sweden

Personal mobility in Norway is high, among the highest in Europe, with privately owned passenger vehicles making up the largest share of the passenger transportation work. Historical data indicate that the average distance driven annually by passenger vehicles in Norway has been declining since 2007[11]. During this peak year, passenger vehicles in Norway were driven an average of 14,000 km annually.

In 2023, the average Norwegian passenger vehicle travelled about 11,300 km.[18] The expected yearly travelled distance for the vehicles in the portfolio is in this analysis estimated based on an expectation of a continuing trend of reduced yearly travelled distance, and as an average over the vehicles' lifetime.

The average age of passenger vehicles scrapped for refund in Norway in 2023 was 18 years.[19] The history of modern EVs is short, and there is yet no evidence for the lifetime of EVs being different from that of other vehicles. Due to uncertainties related to the expected lifetime of new vehicles sold between 2013 and 2024, the average lifetime for passenger vehicles in this analysis is set to 18 years.

4.2.2 Electric vehicle policy in Norway

The Norwegian government has, over time, with different administrations, had high ambitions both regarding electric vehicles and biofuel to reduce CO_2 emissions. There were 789,000 electric passenger

[15] https://www.sparebank1.no/nb/smn/om-oss/barekraft/rammeverk-for-gronn-finansiering.html
[16] https://www.climatebonds.net/standard/transport
[17] https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf
[18] Statistics Norway 12578: Kjørelengder, etter kjøretøytype, drivstofftype, alder, statistikkvariabel og år, 2024
[19] Statistics Norway 05522: Vehicles scrapped for refund, by contents and year, 2024

vehicles on Norwegian roads by the end of 2024, which accounts for 27 percent of the total passenger vehicle stock[20]. The Norwegian Government's targets are that all new light-duty and passenger vehicles sold should be zero-emission from 2025, and that new heavy-duty vehicle sales should be zero-emission or biogas by 2030[21].

The Norwegian EV policy, one of the world's most ambitious EV policies, was effectively put into motion by a series of green incentives, including tax exemption on VAT and registration tax, free fares on the many toll roads and ferries, and free parking and charging in cities.

In 2023, the Norwegian government adjusted the previous VAT exemption to only be applicable up to NOK 500,000 of the purchase price. Additionally, EV vehicles now need to pay a registration fee to the same degree as fossil fuel vehicles. Many of the other benefits have been reduced, but EVs are still currently paying up to a maximum, by law, of 70 percent of the standard tariffs for toll roads, and 50 percent of standard tariffs for parking and ferries.

4.2.3 Biofuel policy in Norway

Norway has an ambitious biofuel policy. From 2018, legislation required all petrol retailers to sell fuel containing biofuels to road traffic. The policy has since evolved. The current government platform has an emphasis on avoiding the usage of biofuels with a high risk of increasing deforestation and strengthens the obligations to utilise second-generation biofuels in the fuels sold[22].

In 2024, the overall quota obligation of biofuels to road traffic was 19 percent, whereof the advanced biofuel requirement was set at 12.5 percent. To incentivise the use of advanced biofuels, one litre of advanced biofuels is counted as two litres of conventional biofuel, for every litre that exceeds the 12.5 percent advanced biofuel requirement[23].Subsequently, the overall use of advanced biofuels has increased. Biofuels made up 15 percent of fuels consumed by domestic road traffic in 2023, up from 12 percent in 2022. Due to the increased use of EVs, the total volume of fuels sold in Norway has decreased in recent years. The overall volume of biofuel has therefore been relatively stable, since the percentage of biofuels has increased[24].

Road taxes (no; veibruksavgift) for all biofuels were introduced in 2020. The taxation of bioethanol is around 50 percent lower than that on standard gasoline. The road tax for biodiesel is similar to that for conventional diesel, with biodiesel taxes being 10 percent higher in 2024[25]. Legislation passed in 2016 mandates that biofuels and liquid biofuels must have a minimum of 50 percent lower life cycle greenhouse gas (GHG) emissions than fossil fuels[16].

In 2023, more than 80 percent of the advanced biofuels in the Norwegian transportation sector were derived from used frying oil and animal fat, mostly imported from the USA and China. There were no reports of biofuels sold in Norway containing soy or palm oil in 2023, aligning with the goal to reduce the use of raw materials with a high risk for deforestation[17].

[20] Statistics Norway 07849: Registered vehicles, by type of transport and type of fuel (M) 2008 - 2023, 2024
[21] https://www.regjeringen.no/no/tema/transport-og-kommunikasjon/veg_og_vegtrafikk/faktaartikler-vei-og-ts/norge-er-elektrisk/id2677481, 2024
[22] https://www.regjeringen.no/no/dokumenter/hurdalsplattformen/id2877252, 2023
[23] https://lovdata.no/dokument/SF/forskrift/2004-06-01-922/KAPITTEL_5#KAPITTEL_5, 2024
[24] https://www.miljodirektoratet.no/aktuelt/fagmeldinger/2024/juli-2024/nye-omsetningskrav-ga-mer-biodrivstoff-i-2023, 2024
[25] https://www.skatteetaten.no/satser/veibruksavgift/?year=2024#rateShowYear, 2024

4.3 Climate gas emissions (Scope 1 and 2)

Categorising the emissions, we have chosen to use the CBI guidelines for the emission calculations. CBI's *Land Transport Background Paper* underlines the focus on tailpipe emissions because of their dominance, the need to send strong signals to vehicle purchasers, and the need to promote technologies and infrastructure that have the potential to radically shift emissions trajectories and avoid fossil fuel lock-in[26]. We do, however, include information on indirect emissions related to power production.

4.3.1 Indicators

In this analysis, we are using two relevant climate gas emission indicators for vehicles:

- Emissions per kilometre [gCO2/km]
- Emissions per passenger-kilometre [gCO2/pkm]

The vehicle fleet composition and emissions from the different types of vehicles are used to calculate the emissions per kilometre.

A passenger-kilometre, abbreviated as pkm, is the unit of measurement representing the transport of one passenger over one kilometre. Passenger-kilometres are found by multiplying the number of passengers by the corresponding number of kilometres travelled.

A vehicle occupancy of 1.7 persons in passenger vehicles has been adopted in this analysis.[27]

4.3.2 Direct emissions (tailpipe) – Scope 1

Baseline of Fossil Fuel Combustion Vehicles and Avoided Emissions from EVs

Under scope 1 emissions, we calculate the "Direct tailpipe CO_2 emissions from fossil fuels combustion" avoided[19].

The estimation of the baseline is performed through three steps:

1. Estimating the gross CO_2 emissions per km (c) from the average vehicle that is being substituted by the zero-emission vehicle.
2. Multiplied by the number of km (d) the vehicle is estimated to travel.
3. Multiplied by the number (n) of vehicles substituting for fossil vehicles in the portfolio.

This can be described in the following equation:

$$E_{baseline} = c_{weighted\ average} \cdot d_y \cdot n_{total} = E_{avoided}$$

All EVs and fuel cell vehicles are considered eligible with zero tailpipe emissions. Therefore, in scope 1 calculations, the emissions from these vehicles are set to zero, and the baseline will amount to the total avoided emissions.

To estimate the annual emissions avoided by the eligible assets, projections are made for direct tailpipe CO2 emissions from fossil fuel combustion in the national vehicle fleets.

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[26] C. Moore, J. Leigh-Bell and H. Jackson, "Land Transport Criteria Version 2," Climate Bonds intitiative, London, 2020.
[27] https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/mindre-utslipp-per-kjorte-kilometer

For the substituted fossil-fuelled vehicles, emission data are retrieved from recognised test methods and not actual registrations of emissions in a Nordic climate.

Biofuels are already, to some degree, mixed with fossil fuels in Norway. The reduced emissions due to these contributions are considered in the emission calculations from fossil fuel vehicles. As fossil fuel vehicle emissions are the baseline for EV emission calculation, the biofuels are in effect reducing the impact of the EVs.

Norway aims to reduce emissions from fossil-fuelled vehicles by using biofuel in the fuel sold before 2030. The marginal emission reduction possibly obtained through these political goals between 2024-2030 has been accounted for in the analysis. It is assumed that the biofuel share in the fuel mix will remain constant between 2030 and the end of the vehicles' lifetime, assumed to be in 2041 for passenger vehicles registered in 2024.

To estimate the weighted average of emissions per fossil vehicle ($c_{weighted\ average}$) we use the average annual emission from new vehicle models from 2011-2024[28].

To estimate the distance travelled by the average vehicle, we assume that EVs drive the average of the total vehicle portfolio for each vehicle type in each country, each year it is used in its lifetime. Statistics of annual driven distance by electric, diesel and gasoline cars younger than 10 years build up under this assumption[29].

Traffic volumes per passenger vehicle have shown a historic decline. We use linear regression on the publicly available datasets and extrapolate until 2041. This is a conservative approach as it is likely, at some point, to see flattening.

Emission Factors – Scope 1

Table 4-1 presents the calculated emission factors and CO_2 emissions in a year for the relevant vehicle categories. The numbers are based on calculated gross tailpipe CO_2 emissions for the average vehicle produced in each of the years between 2011 and 2024, biofuel and fossil fuel content in petrol/diesel pumped in each year between 2024 and the end of the vehicle's lifetime, and the travelled annual distance for the average vehicle.

Table 4-1 Passenger vehicles: Greenhouse gas emission factors (CO2-eq) for substituted fossil vehicles and EVs, average direct emissions.

	Direct emissions per passenger-km [gCO2/pkm]	Direct emissions per km [gCO2/km]	Direct emissions per vehicle per year [kgCO2/vehicle/year]
Substituted fossil passenger vehicles – average	57	97	892
Electric passenger vehicles	0	0	0

4.3.3 Indirect emissions (Power consumption only) – Scope 2

Under scope 2 emissions, we calculate the "Indirect emissions from electricity consumption"[19].

[28] https://ofv.no/CO2-utslippet/co2-utslippet, 2025
[29] https://www.ssb.no/en/statbank/table/08307, 2025

The GHG emission intensity baseline for power consumption may be calculated with different system boundaries. Norway trades power internationally through an interconnected European electricity grid. For impact calculations of all power consumption, and even electrification of transportation, the regional or European production mix is more relevant than the national power production mix and is the basis for the main analysis in this report. We have, however, also included calculations of indirect emissions from power production, setting the system boundary at national borders.

The direct emissions in power production in Europe (EU27, UK and Norway) [30] is expected to be dramatically reduced in the coming decades. The emission trajectory used in this analysis takes into consideration the 1.5°C scenario and a substantial reduction of emissions from the power sector towards zero emissions in 2050. This aligns with the EU's ambitious goal of decarbonising the power sector[31].

For this section, a three-year average emission factor for power in Europe (EU27, UK and Norway) is applied. The most recent numbers are for 2023, so the interval 2021-2023 is used.[32] These values will vary from year to year. To demonstrate how emissions vary depending on grid factor and for clarity when comparing avoided emissions from other segments, two more grid factors mentioned in section 1.3 are included: Norwegian physically delivered electricity in 2023 and the Norwegian residual mix for 2023.[33] The mentioned grid factors are shown in Table 4-2 below.

Table 4-2 Electricity emission factors for the European average production mix and for the two Norwegian electricity mixes [CO2-eq].

Scenario	Emission factor [gCO2/kWh]
European (EU27+UK+Norway) production mix average 2021- 2023	231
Norwegian physically delivered electricity 2023	15
Norwegian residual mix 2023	599

The following calculations employ the emission factor as an average from the European 2023 baseline, as seen in Table 4-2, and consider the expected lifetime for the of vehicles, adhering to the anticipated declining trajectory. The projected trajectories related to European power production, from 2024 onwards, will influence the indirect emissions and the avoided emissions from the vehicle portfolio. A different method is employed to estimate the emission factor based solely on the Norwegian mixes.

The energy consumption of EVs is very much dependent on size and outdoor temperature. There is not sufficient available data to ensure an accurate estimation of energy consumption for the average EV. In these calculations, the average for all currently available EV models in the EV Database, 0.189 kWh/km, is applied[34].

In Table 4-3, indirect emission factors are presented for the European power production mix and the Norwegian electricity mixes for EVs. Fossil fuelled alternatives do not involve electricity consumption or indirect emissions.

[30] EU27, UK and Norway include all European countries except Iceland, Cyprus, Ukraine, Russia, and Moldova, plus United Kingdom and Norway.
[31] G. Amanatidis, "Briefing - European policies on climate and energy towards 2020, 20230 and 2050," European Parliament Policy Department for Economic, Scientific and Quality of Life Policies Directorate-General for Internal Policies, Brussels, 2019
[32] https://www.aib-net.org/facts/european-residual-mix/2023, 2024
[33] https://www.nve.no/energi/energisystem/energibruk/stroemdeklarasjoner/, 2024
[34] https://ev-database.org/cheatsheet/energy-consumption-electric-car, 2025

*Table 4-3 Annual average GHG emission factors [CO2-eq] per distance for electric **passenger vehicles**, based on EU27 plus UK and Norway average power production mix 2021-2023, Norwegian physically delivered electricity mix 2023 and Norwegian residual mix 2023.*

	Indirect emissions per passenger-km [gCO_2/pkm]	Indirect emissions per km [gCO_2/km]
European production mix 2021-2023	16.7	28.3
Norwegian physically delivered el. 2023	1.7	2.8
Norwegian residual mix 2023	66.6	113.1

Note that there are indirect emissions related to fossil fuel as well, scope 3 emissions, which are not included in this analysis. Scope 3 emissions differ between fossil and electric vehicles mostly due to the batteries, where there is rapid technology development.

4.4 Impact assessment – Electric Vehicles

The 11,114 eligible electric passenger vehicles in SMN's portfolio are estimated to drive 102 million kilometres in a year. The available data from the bank includes the current number of contracts and related portfolio volume. Table 4-4 shows the number of eligible EVs in the portfolio with calculated average yearly driven distances.

Table 4-4 Number of eligible passenger vehicles and expected yearly mileage.

	No. of vehicles	Sum distance [km/year]	Sum distance [pkm/year]
Eligible passenger vehicles	9,662	101.8 million	173.1 million

The tables below present the lower CO_2 emissions of the eligible assets in the portfolio, compared to the baseline, as reductions in both direct and indirect emissions, expressed in rounded numbers, during an average year over the vehicles' lifespan. Note that the indirect emissions are only calculated for EVs and not for fossil-fuelled alternatives.

Direct emissions in the following tables are calculated by multiplying distance travelled [km] by the vehicles in the portfolio in a year, by the specific emission factors [gCO2/km]. Indirect emissions are calculated by multiplying the distance travelled [km] by the vehicles in the portfolio in a year by the specific emission factors [gCO2/km].

In Table 4-5, the direct, indirect and sum of avoided emissions are presented for the portfolio based on all indirect emission grid factors mentioned in Table 4-2, i.e. the European power production mix 2021-2023, Norwegian electricity mix considering export/import and Norwegian residual mix for 2023. The table enables comparison with the bank's impact reporting on other green bond asset classes and financed emissions across all assets – green and others. Impact is not scaled based on the bank's share of financing.

Table 4-5 The portfolio's estimated impact on GHG emissions. Indirect emissions are based on the three emission factors.

	Avoided CO_2 emissions compared to baseline [tonnes of CO2-eq/year]		
	European production mix 2021-2023	Norwegian physically delivered el. 2023	Norwegian residual mix 2023
Direct emissions only (Scope 1)	9,910	9,910	9,910
Indirect emissions of EVs only (Scope 2)	-2,890	-290	-11,520
Direct and indirect emissions	7,020	9,620	-1,610

Note that the high residual mix for Norway leads to net negative avoided emissions.

The reduction in direct emissions from passenger vehicles corresponds to 4.1 million litres of gasoline saved per year.

5 Renewable energy

Hydropower has played a significant role in Norway's power production since the Industrial Revolution. Hydropower remains a crucial component of the national energy mix, producing 140 TWh annually and accounting for 89 percent of the national electricity production[35]. Onshore wind and solar power account for 10 percent (15 TWh/yr) of the national power production. The Norwegian Government has set a target to increase the electricity production from solar energy to 8 TWh by 2030.

Power production development in Norway is strictly regulated and subject to licensing and is overseen by the 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 emphasises preserving the environment. The Norwegian part of the NVE homepage gives detailed information about different requirements for different kinds of projects[35].

Data about the Norwegian assets (power plants) is available from the NVE, as all assets are subject to licensing.

5.1 Eligibility

SpareBank 1 SMN's Green Finance Framework pertains to equipment, development, manufacturing, construction, operation, distribution and maintenance of renewable energy power plants generating electricity from solar power, wind power and hydropower.

The green loan portfolio of SpareBank 1 SMN assessed in this report contains Norwegian renewable energy power plants generating electricity from hydropower.

The EU Taxonomy's "Do no significant harm" (DNSH) criteria for hydropower, wind power and solar power address environmental, social and governance (ESG) issues. The adaptation and resilience component in Climate Bonds Initiative (CBI) hydropower eligibility criteria and the DNSH criteria is, in the Norwegian context, to a large degree covered by the relevant requirements in the Norwegian regulation of energy plants. All Norwegian hydropower and wind power assets conform to very high standards regarding environmental and social impact. Portfolio alignment with DNSH requirements has not been assessed in detail.

5.1.1 Hydropower

According to the SpareBank 1 SMN's Green Finance Framework, hydropower plants in Norway (boreal regions) qualify for green bonds if they meet one of the following criteria:

i. life cycle emissions of less than 100 gCO2-eq/kWh,
ii. power density greater than 5 W/m^2, or
iii. the electricity generation facility is a run-of-river plant and does not have an artificial reservoir

The eligibility criteria are formulated in line with the CBI criteria[36], and the emissions threshold is in line with the threshold of 100 gCO2-eq/kWh in the June 2021 EU Taxonomy Annex I to the Commission Delegated Regulation[37].

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[35] Statistic Norway Table 08307: Production, imports, exports and consumption of electric energy: https://www.ssb.no/en/statbank/table/08307
[36] https://www.climatebonds.net/standard/hydropower
[37] https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf

Hydropower plants with power density over 5 W/m^2 are exempt from the most detailed investigations. For Norwegian hydropower assets, these criteria are 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, Norwegian reservoirs are not exposed to cyclic revegetation of impoundment, and hence the negative impacts on GHG emissions from these reservoirs are minuscule. Hydropower stations with high hydraulic head or relatively small, impounded areas have high power density.

The eligibility criteria mentioned above are central to the EU Taxonomy. Most DNSH requirements are covered by the current national regulation of hydropower, however, with exemptions.

5.2 Eligible assets in the portfolio

SpareBank 1 SMN's portfolio contains 10 smaller hydropower plants in operation with installed capacities ranging from 0.1 to 2.9 MW. These are run-of-river plants or small reservoir hydropower plants which hence have a higher power density of several thousand W/m^2 (ratio between capacity and impounded area).

Multiconsult can verify that SpareBank 1 SMN's eligible assets have low to negligible GHG emissions related to construction and operation.

5.3 Emission factors and production estimates

5.3.1 CO_2 emissions from renewable energy power production

All power production facilities have a negative impact on GHG emissions. Instead of calculating the individual impact on GHG emissions for the facilities in the portfolio, we refer to Association of Issuing Bodies (AIB)[38]. AIB, as referred to by NVE[39], has used an emission factor of 6 gCO_2/kWh for all European hydropower in their 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 hydropower assets, even though the factors are reported higher than in other credible sources in Norwegian context. For instance, Østfoldforskning[40] calculated the life-cycle emissions of Norwegian hydropower across all categories to 3.33 gCO_2-eq/kWh.

For the assets in the portfolio, with run-of-river and small hydropower assets, the AIB emission factor is regarded as conservative in an impact assessment setting. Given an average emission factor for all European hydropower of 6 gCO2-eq/kWh, the positive impact of hydropower is 130 gCO2-eq/kWh compared to the European electricity mix baseline of 136 gCO2-eq/kWh from Table 1-1.

When applying the Norwegian location-based production mix and market-based residual mix emission factors from Table 1-1 as baselines, the positive impact of hydropower changes significantly. The Norwegian location-based production mix as baseline results in a positive impact of 9 gCO2-eq/kWh for hydropower while the Norwegian market-based residual mix as baseline hoists the positive impact of hydropower to 593 gCO2-eq/kWh.

[38] https://www.aib-net.org/, 2024
[39] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/, 2019
[40] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf

5.3.2 Power production estimates

The renewable energy power plants in SMN's portfolio are somewhat varied in age with start of operation ranging from year 1998 to 2015 (mean year 2008, standard deviation 4.4 years). Production and installed capacity have been attained by using the NVE's hydropower database[41].

It is important to note that the indicated power production capacity in the licensing documents does not necessarily represent what can realistically be expected from the plant over time. For hydropower, 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 facilities has shown that actual production (expected production) is often more than 20 percent lower (80% efficiency) than the licensing/pre-construction figures (estimated production). There is no equivalent evidence to claim the same mismatch for large hydropower facilities.

5.4 Impact assessment – Renewable energy

The eligible hydropower plants in SpareBank 1 SMN's portfolio have an estimated production capacity of around 42 GWh per year and an expected production capacity of nearly 34 GWh per year. The bank has not provided the loan-to-value ratios for the plants in the portfolio – hence the production and impact estimates presented below are not scaled to reflect the bank's share of financing.

Table 5-1 shows the capacity, number of plants, estimated and expected production for the assets in SpareBank 1 SMN's portfolio.

Table 5-1 Capacity and annual production of identified eligible plants

	No. of plants	Capacity [MW]	Estimated production [GWh/year]	Expected production [GWh/year]
Small hydropower	10	12.5	42.1	33.7

The expected renewable energy produced by the eligible assets in the portfolio in an average year and the resulting avoided CO_2 emissions from the energy production is summarized in Table 5-2. Avoided emissions are presented based on all three emission factors from Table 1-1.

Due to the frequently overestimated annual production in small hydropower plants, the expected impact is conservatively calculated by reducing the estimated production by 20 percent (80% efficiency), cf discussion above.

Table 5-2 Expected annual power production and positive impact on GHG emissions

	Expected production [GWh/year]	Avoided emissions compared to baseline [tons CO2-eq/year]		
		European electricity mix	Norwegian location-based production mix	Norwegian market-based residual mix
Identified eligible hydropower plants in portfolio	34	4,378	303	19,972

[41] https://www.nve.no/energi/energisystem/vannkraft/vannkraftdatabase/