REPORT

SpareBank 1 Nord-Norge Green Portfolio Impact Assessment FY2023

CLIENT

SpareBank 1 Nord-Norge

SUBJECT

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

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SUBJECT	Impact assessment- energy efficient residential and commercial buildings, electric vehicles, and renewable energy	ACCESSIBILITY	Open
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In summary, impact assessed for all examined asset classes in the SpareBank 1 Nord-Norge portfolio qualifying according to the bank's Green Bond Framework is dominated by renewable energy but with significant contributions from all asset classes.

The total impact of the assets in the portfolio is estimated to 145,500 tonnes CO_2e/year:

Energy efficient residential buildings	*4,724 tonnes CO_2e/year*
Energy efficient commercial buildings	*1,636 tonnes CO_2e/year*
Clean transportation	*1,478 tonnes CO_2e/year*
Renewable energy	*137,651 tonnes CO_2e/year*
Total	***145,489 tonnes CO_2e/year***

Note that for clean transportation, the unscaled impact is the sum of 2,474 tonnes CO_2e/year Scope 1 emissions, and - 996 tonnes CO_2e/year in Scope 2 emissions.

When scaled by the banks share of financing, the impact is estimated to 31,800 tonnes CO_2e/year:

Energy efficient residential buildings	*2,372 tonnes CO_2e/year*
Energy efficient commercial buildings	*1,029 tonnes CO_2e/year*
Clean transportation	*1,001 tonnes CO_2e/year*
Renewable energy	*27,405 tonnes CO_2e/year*
Total	***31,807 tonnes CO_2e/year***

Note that for clean transportation, the scaled impact is the sum of 1,691 tonnes CO_2e/year Scope 1 emissions, and - 690 tonnes CO_2e/year in Scope 2 emissions.

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1 Introduction

Assignment

On assignment from SpareBank 1 Nord-Norge, Multiconsult has assessed the impact of the part of the bank's loan portfolio eligible for green bonds according to SpareBank 1 Nord-Norge's Green Bonds Framework[1].

In this document we briefly describe SpareBank 1 Nord-Norge's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio of SpareBank 1 Nord-Norge. More detailed documentation on baseline, methodologies and eligibility criteria is made available on the bank'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 percent hydropower and 10 percent 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.

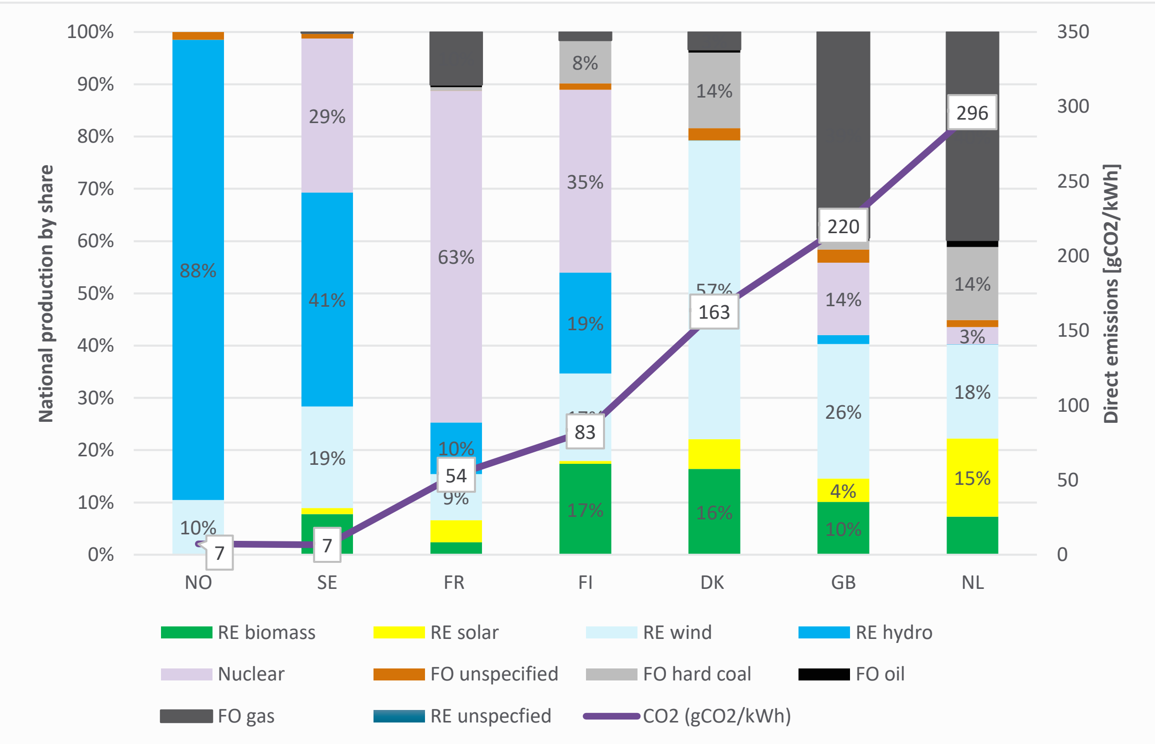

Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2022, Association of Issuing Bodies[2])

[1] https://www.sparebank1.no/nb/nord-norge/om-oss/baerekraft/rammeverk-for-gronne-obligasjoner.html
[2] 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 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 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 emission factor
European (EU27 + UK + Norway) electricity mix	136 gCO_2/kWh
Norwegian electricity mix	18 gCO_2/kWh

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, including the influence of bioenergy and district heating in the energy mix[4], is on average 115 gCO_2/kWh. This factor is used in impact calculations in sections 2, 3 and 5.

The average emission factor relevant for electric vehicles is instead calculated based on the last three-year average for the European production mix. This is described in more detail in section 4.

[3] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[4] Multiconsult on assignment from DiBK, 2015.

2 Energy efficient residential buildings

The SpareBank 1 Norge-Norge criteria for green residential buildings in Norway has two parts:

- Buildings built after or in 2021: buildings complying with the relevant NZEB-10 threshold
- Buildings built before 2021: EPC A label or within the top 15 percent low carbon buildings in Norway

The bank has identified the qualifying buildings in their residential loan portfolio according to these criteria, for which Multiconsult has calculated impact.

In this chapter, a method for identifying buildings based on the NZEB-10 percent criterion is described, which the bank has used to identify new eligible buildings. This is followed by impact calculations for the green residential buildings.

The SpareBank 1 Nord-Norge green bond framework also has a refurbishment criterion. This is not considered in this assessment.

2.1 New residential buildings NZEB-10 percent - criteria for buildings finished since December 31st, 2020

The EU Taxonomy for sustainable activities distinguishes between new and existing buildings, with criteria dependent on whether the building is completed before or after 31 December 2020. The technical screening criteria for new buildings requires the building to have an energy performance, described in 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 on the back of the national definition of nearly zero energy buildings (NZEB) of January 2023. As the building code and the national Energy Performance Certificates System (EPC) are key to understand the NZEB definition and to efficiently identify buildings complying to a new build criterion for green buildings, some background information on these and how the Norwegian residential building stock perform today is included below.

The Norwegian national definition of NZEB was published in January 2023. The NZEB definition has clear references to the building code TEK17, and in practical terms, the definition is no stricter than TEK17. The difference lies in a) a shift of system boundary to delivered energy and by introducing primary energy factors, and b) an exclusion of energy demand related to lighting and technical equipment.

The definition introduces primary energy factors, set to 1 for all energy carriers. Table 2 shows the NZEB thresholds for residential buildings where specific primary energy demand as presented in the published guidance paper. It is to be noted that the threshold for small residential buildings is influenced by the heated utility floor space of the building by a factor (1,600/heated utility floor space) and that one value has been changed.

Table 2 Specific primary energy demand. (Source: guidance paper[5])

Building category	Specific energy demand- Nearly zero-energy building (NZEB)
Small residential buildings	(76[6] + 1600/m^2) kWh/m^2
Apartment buildings	67 kWh/m^2

For residential buildings, the specific energy demand threshold is related to, but not directly comparable to, the requirements in the building code (Figure 2) as energy demand for lighting and technical equipment is excluded in the NZEB definition. This demand is, however, fixed values in both the building code calculations and in the EPC energy label calculations, hence, can be added or subtracted in conversions between the two systems.

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

2.1.1 Identifying the buildings with performance at NZEB-10 percent or better

Documentation by NZEB definition referenced standard

One way to document an NZEB-10 percent energy performance, is to present results from calculation in accordance with Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings - Method and data*. These calculations are required for all new buildings and a central part of the required documentation to get a building permit and certification of completion. This is however documentation that is not easily available in public registers, hence for banks. It is also not easily accessible information for non-experts unless clear descriptions of results relevant for the NZEB definition is presented.

Documentation by EPC data

Another, and more practical and available option for identifying qualifying objects in a bank's portfolio, is to retrieve sufficient data from the EPC database combined with data on dwelling size. Where reliable area data is not available to the bank, the national average in the building statistics may be used. This is also more in-line with documentation requirement in EU taxonomy Annex 1. The Norwegian EPC system is not yet using primary energy, but this might be included in an upcoming change in the EPC system. Since the information accompanying the NZEB definition set national primary energy factors to 1 (one) flat for all energy carriers, it is a fair assumption that specific net delivered energy in the EPC system is equal to specific primary energy demand in the NZEB definition.

The energy label (A to G) in the EPC system is based on calculated net delivered energy, including the efficiencies of the building's energy system (power, heat pump, district energy, solar energy etc.). Table 3 describes how the limit values are dependent on the area of the dwelling. The building codes are defined by calculated net energy demand, not including the building's energy system and requirements independent of dwelling area. Both systems include all standard consumption, also lighting and technical equipment.

[5] https://www.regjeringen.no/contentassets/60e8f8ec02e246079f4af4d9578d78c2/veiledning-om-beregning-av-primarenergibehov-og-nesten-nullenergibygg.pdf
[6] Corrected value based on assumed error in the published paper. Corrected from 86 to 76 by Multiconsult. If kept NZEB would be less efficient than buildings adhering to the current building code TEK17.

Table 3 EPC labels limit values for residential building categories and dependency on building area. (Source: enova.no/energimerking)

Building categories	Calculated delivered energy pr m² heated space (kWh/m² BRA)						
	A	**B**	**C**	**D**	**E**	**F**	**G**
	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	No limit
Detached or semi-detached residential dwelling	95	120	145	175	205	250	>F
Sqm. adjustment	+800/A	+1600/A	+2500/A	+4100/A	+5800/A	+8000/A	
Appartments	85	95	110	135	160	200	>F
Sqm. adjustment	+600/A	+1000/A	+1500/A	+2200/A	+3000/A	+4000/A	

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

In Figure 2 the columns describe the thresholds in the EPC system for labels A, B and C where area correction is applied for a small residential building with heated area of 166 m², a single apartment of 65 m² and an apartment building of 2,000 m². The lines indicate the calculated NZEB and NZEB-10 percent thresholds calculated by adding the fixed values for lighting and technical equipment. Table 4 gives a more granular picture including more dwelling and building sizes.

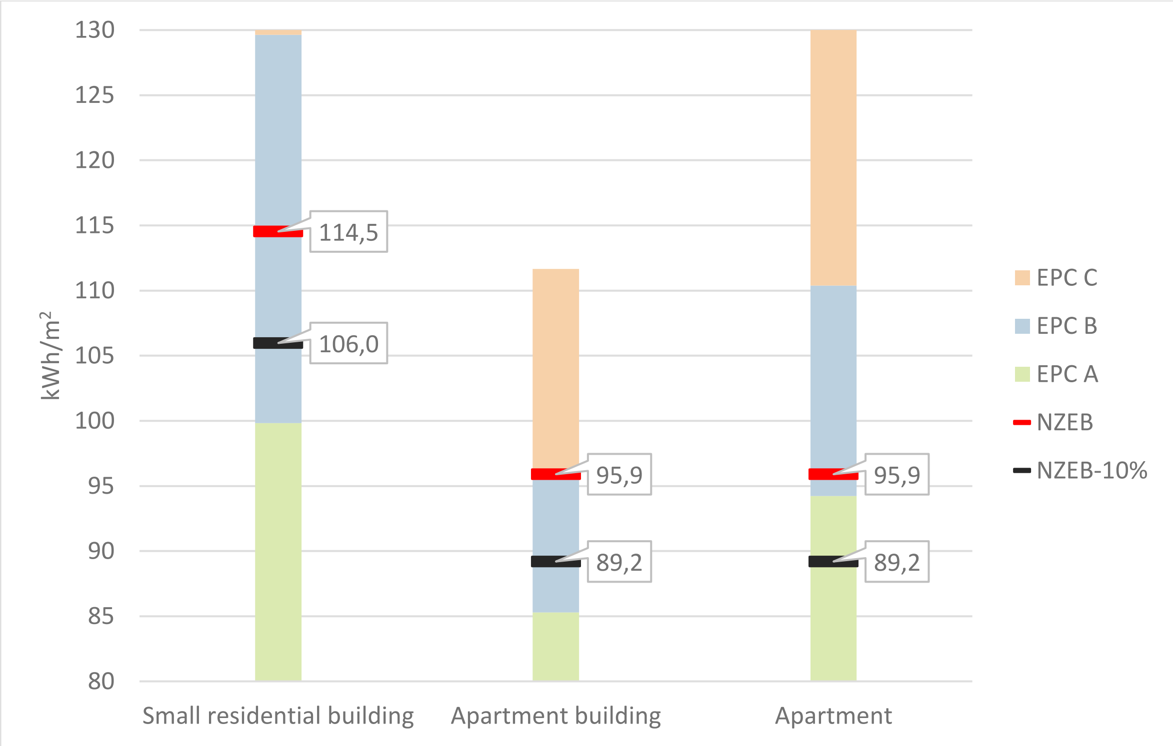

Figure 2 Energy performance with reference to the national definition of NZEB and NZEB-10 percent compared to limit values in the EPC system (values dependent on dwelling area).

Table 4 Qualifying EPC labels dependent on dwelling area.

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

The thresholds in Figure 2 are calculated based on standard values for lighting and technical equipment in the Norwegian standards and average building areas found in building statistics for 2021. Due to the area correction factor, the threshold can be calculated individually for all objects in the portfolio based on actual area. For apartments, the NZEB-lines in the figure are constant but the EPC thresholds dependent on apartment size. For small residential buildings, both NZEB and EPC energy label thresholds are dependent on the size of the dwelling.

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

A complicating factor for apartments in a bank's portfolio when using the EPC data to identify qualifying objects, is the fact that the NZEB definition, as is the case for the building code calculations, considers the whole building as one unit and not the sum of individual apartments. In the current EPC system, each apartment is labelled individually. The EPC limit values reflect individual apartments sharing walls with heated area, as other apartments, and consequently are lower than what is the case for buildings. There is an area correction factor in the EPC label calculations, but not in the building code and NZEB calculations for apartment buildings. Using the individual apartment area correction factor in the EPC system results in an NZEB threshold, converted to EPC terms, much stricter than for all other building categories. In an upcoming change in the EPC system, the whole apartment building is anticipated to be labelled as a unit. This will simplify the conversion between the EPC system and the NZEB definition, however, energy certificates based on the current system will be around for many years as the period of validity is 10 years. There are, however, also today exemptions. The EPC regulation opens for establishing certificates for apartments based on calculations for the apartment building as one unit, and this is when all apartments are smaller than 50 m^2. The area correction is then based on the building's total area and not the sum of apartments only. Assuming this approach may also be used for all apartment buildings, the "apartment" column in Figure 2 illustrate EPC thresholds using an average apartment building size derived from 2021 building data from Statistics Norway.

2.1.2 Eligibility small residential buildings

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

The EPC energy label A limit values, as described in specific energy demand in Figure 2 and Table 4, are for all small residential buildings independent of building size below NZEB-10 percent. Hence, an energy label A is sufficient to identify green buildings of this category. As illustrated by the above analysis, only qualifying small residential EPC A buildings is a conservative approach, as some EPC B buildings also would qualify. The more granular specific delivered energy demand is made available from the EPC system and can supplement the straightforward qualifying label A buildings in the green pool with some buildings with energy label B.

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

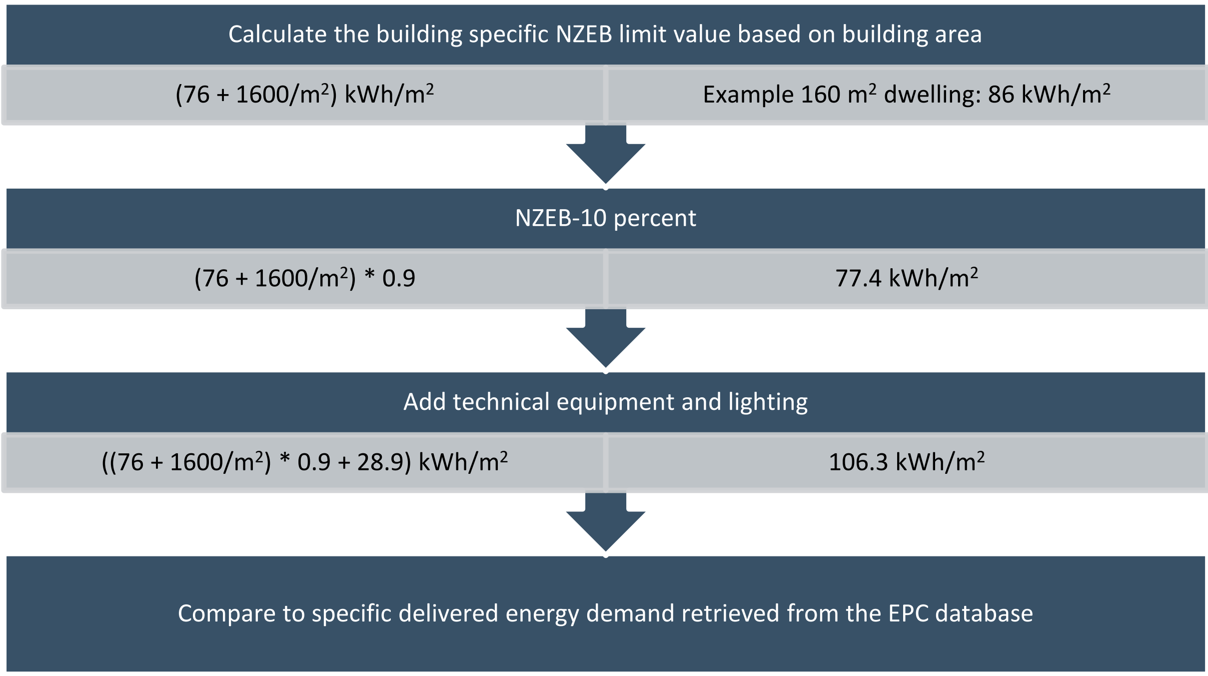

Figure 3 How to compare NZEB-10 percent to specific energy demand from the EPC system for small residential buildings.

2.1.3 *Eligibility apartments and apartment buildings*

With energy label only available on apartment level, and not building level, an EPC A energy label is alone not sufficient to identify a NZEB-10 percent performance of an apartment without additional assumptions. An apartment building may even in the current EPC system be analysed and provided a certificate and an energy label as one unit, and the last rows in Table 4 illustrate that for such a case the energy label A would be sufficient to identify and qualify apartment buildings, and the apartments within. In the same manner, the specific delivered energy demand retrieved for each apartment, in addition to area of apartment and building, can be combined to qualify even some apartments with energy label B.

As illustrated in Figure 2, there are two potential approaches to understanding and comparing the NZEB definition and the EPC data. One is ignoring the difference that lies in the NZEB-definition relating to the whole building while the EPC system relates to individual apartments ("apartment" column in Figure 2). The practical approach utilizing detailed EPC data on the individual apartment can then be described by Step 1 in Figure 4 and compare this value to the specific delivered energy retrieved from the EPC database. Step 1 is independent of apartment and apartment building size and translates the NZEB-10 percent threshold to a limit value comparable to the specific delivered energy in the EPC system.

As an alternative, taking into account that apartment buildings also in the EPC system may be considered as one unit, and expand this approach beyond apartment buildings with only small apartments, Step 2 in Figure 4 can be applied in addition to Step 1. This requires information on EPC energy label, apartment area and apartment building area, here illustrated by an apartment of 65 m^2 just qualifying for an EPC A placed in a 2,000 m^2 building. The implications of an area correction factor diminish for large buildings, as illustrated in Table 4 hence opening for using average values from national statistics instead of precise area data. Apartment area is available in the EPC database.

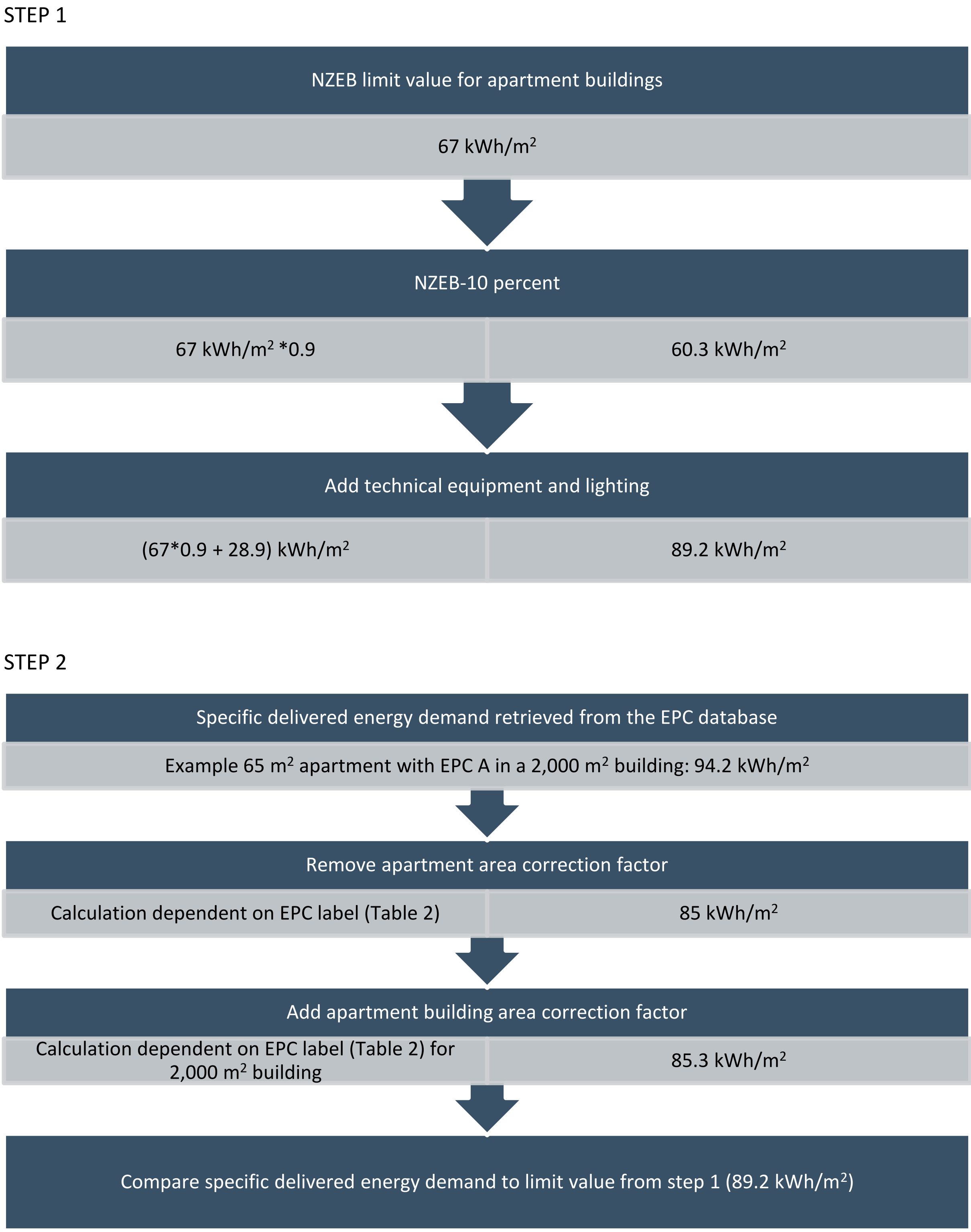

Figure 4 How to compare NZEB-10 percent to specific energy demand from the EPC system for apartments.

2.2 Top 15 percent residential buildings - criteria for buildings finished before January 1st 2021

The SpareBank 1 Norge-Norge criteria for existing residential buildings identify buildings with EPC A or within the top 15 percent most energy efficient buildings in Norway as eligible. The bank has identified the eligible buildings in their portfolio, following NVE's suggested limit values per 2023 and using registered energy performance certificates or estimated energy usage from Eiendomsverdi.

2.3 Impact assessment - Residential buildings

The eligible residential buildings in SpareBank 1 Nord-Norge's portfolio are estimated to amount to 438,400 square meters. The bank has supplied reliable information on the objects in the portfolio, including area and registered or estimated energy grade and specific delivered energy.

Table 5 Number of eligible objects qualifying for each criterion.

	No. of units qualifying buildings in portfolio				
	NZEB-10 percent	Grandfathered TEK17 > 2021	EPC A*	EPC B*	EPC C*
Apartments	39	413	56	235	245
Small residential houses	64	271	51	678	919
Total	**103**	**684**	**107**	**913**	**1,164**

Table 6 Calculated building areas of eligible objects qualifying for each criterion.

	Area qualifying buildings in portfolio [m^2]					
	NZEB -10 percent	Grandfathered TEK17 > 2021	EPC A*	EPC B*	EPC C*	Total
Apartments	2,341	30,218	4,430	17,437	23,226	**77,652**
Small residential houses	13,148	45,971	10,024	122,950	168,662	**360,755**
Total	**15,489**	**76,189**	**14,454**	**140,387**	**191,888**	**438,407**

*Top 15 percent most energy efficient buildings have been identified by bank, following NVE's suggested limit values per 2023.

Energy efficiency for the buildings in the portfolio is calculated based on the respective criteria. All these residential buildings are not necessarily included in one single bond issuance.

For the NZEB-10 percent qualifying buildings, impact is estimated by taking the difference between object specific energy demand (supplied by the bank) and the NZEB limit values (section 2.1.1). This difference is multiplied by the emission factor and area of eligible assets to calculate impact for buildings.

For the TEK17 buildings grandfathered under the NZEB-10 percent criteria, the difference between average specific energy demand for each sub-category in the building stock and the average for qualifying buildings is used.

For the buildings qualifying according to the top 15 percent EPC-criterion, the calculations are based on the difference between achieved energy label and weighted average in the EPC database.

To calculate the impact on climate gas emissions, the decreasing trajectory toward 2050 is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bio energy and district heating, resulting in a total specific emission factor of 115 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 7 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 CO_2-emissions.

The impact is also presented scaled by the bank's engagement, which is simply the FY 2023 loan balance share of building value.

Table 7 Performance of eligible objects compared to average residential building stock.

	Area	Avoided energy compared to baseline	Avoided emissions compared to baseline
Buildings eligible under the NZEB - 10 percent criterion	15,489 m^2	0.3 GWh	39 tonnes CO_2/year
Buildings grandfathered under the NZEB - 10 percent criterion	76,189 m^2	10.4 GWh	1,192 tonnes CO_2/year
Buildings eligible under the top 15 percent criterion*	346,728 m^2	30.4 GWh	3,493 tonnes CO_2/year
Eligible residential buildings in portfolio - total	**438,406 m^2**	**41.1 GWh**	**4,724 tonnes CO_2/year**
Total eligible residential buildings in portfolio – scaled by bank's engagement	**216,444 m^2**	**20.7 GWh**	**2,372 tonnes CO_2/year**

3 Energy efficient commercial buildings

3.1 Eligibility criteria

The SpareBank 1 Norge-Norge criteria for green commercial buildings in Norway applied in this analysis has two parts:

- Buildings built after or in 2021: buildings complying with the relevant NZEB-10 threshold
- Buildings built before 2021: EPC A label or within the top 15 percent low carbon buildings in Norway

The bank has identified the qualifying buildings in their commercial loan portfolio according to these criteria, for which Multiconsult has calculated impact.

In this chapter, a method for identifying buildings based on the NZEB-10 percent criterion is described, which the bank has used to identify new eligible buildings. This is followed by impact calculations for the green residential buildings.

The SpareBank 1 Nord-Norge green bond framework also has a refurbishment criterion and a criterion based on certification schemes such as BREEAM-NOR. These are not considered in this assessment.

3.2 New Commercial buildings NZEB-10 percent - criteria for buildings finished since December 31st 2020

As for residential buildings, Multiconsult has assessed the performance of new commercial buildings and how the most energy efficient buildings may be identified in the bank's loan portfolio on the back of the national definition of nearly zero energy buildings (NZEB) of January 2023.

The EU Taxonomy for sustainable activities distinguishes between new and existing buildings, with criteria dependent on whether the building is completed before or after 31 December 2020. The technical screening criteria for new buildings requires the building to have an energy performance, described in 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).

The Norwegian national definition of NZEB was published in January 2023[7]. The NZEB definition has clear references to the building code TEK17, and in practical terms, the definition is no stricter than TEK17. The difference lies in a) a shift of system boundary to delivered energy and by introducing primary energy factors, and b) an exclusion of energy demand related to technical equipment.

The definition introduces primary energy factors, set to 1 for all energy carriers.

[7] https://www.regjeringen.no/no/aktuelt/rettleiing-om-utrekning-av-primarenergibehov-i-bygningar-og-energirammer-for-nesten-nullenergibygningar/id2961158/

Table 8 shows the NZEB thresholds for the type of commercial buildings most relevant in private banks' portfolios with specific primary energy demand as presented in the published guidance paper. The rightmost column indicates specific energy demand when made comparable to building code and EPC system.

Table 8 Specific primary energy demand (Source: guidance paper[8], NS 3031).

Building category	Nearly zero-energy building (NZEB)[9]	NZEB + energy demand technical equipment
Office building	76 kWh/m^2	110.5 kWh/m^2
Hotel building	159 kWh/m^2	164.8 kWh/m^2
Retail/commercial building	162 kWh/m^2	165.7 kWh/m^2
Small industrial buildings and warehouses	113 (138) kWh/m^2	136.5 kWh/m^2

The specific energy demand threshold is related to, but not directly comparable to, the requirements in the building code (Figure 2) as energy demand for technical equipment is excluded in the NZEB definition. This demand is, however, fixed values in both the building code calculations and in the EPC energy label calculations, hence, can be added or subtracted in conversions between the two systems.

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

3.2.1 Identifying the buildings with performance at NZEB-10 percent or better

Documentation by NZEB definition referenced standard

One way to document an NZEB-10 percent energy performance, is to present results from calculation in accordance with Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings - Method and data*. These calculations are required for all new buildings and a central part of the required documentation to get a building permit and a certification of completion. This is however documentation that is not easily available in public registers, hence for banks. It is also not easily accessible information for non-experts unless clear descriptions of results relevant for the NZEB definition is presented.

Documentation by EPC data

Another, and more practical and available option for identifying qualifying objects in a bank's portfolio, is to retrieve sufficient data from the EPC database. This is also more in-line with documentation requirement in EU taxonomy Annex 1. The Norwegian EPC system is not yet using primary energy, but this might be included in an upcoming change in the EPC system. Since the information accompanying the NZEB definition set national primary energy factors to 1 (one) flat for all energy carriers, it is a fair assumption that specific net delivered energy in the EPC system is equal to specific primary energy demand in the NZEB definition.

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

[8] https://www.regjeringen.no/contentassets/60e8f8ec02e246079f4af4d9578d78c2/veiledning-om-beregning-av-primarenergibehov-og-nesten-nullenergibygg.pdf
[9] The figures in brackets apply to building areas where heat recovery of ventilation air entails a risk of spreading contamination or infection[8].

In Figure 5 the columns describe the thresholds in the EPC system for labels A, B and C. The lines indicate the calculated NZEB and NZEB-10 percent thresholds calculated by adding the fixed values for technical equipment.

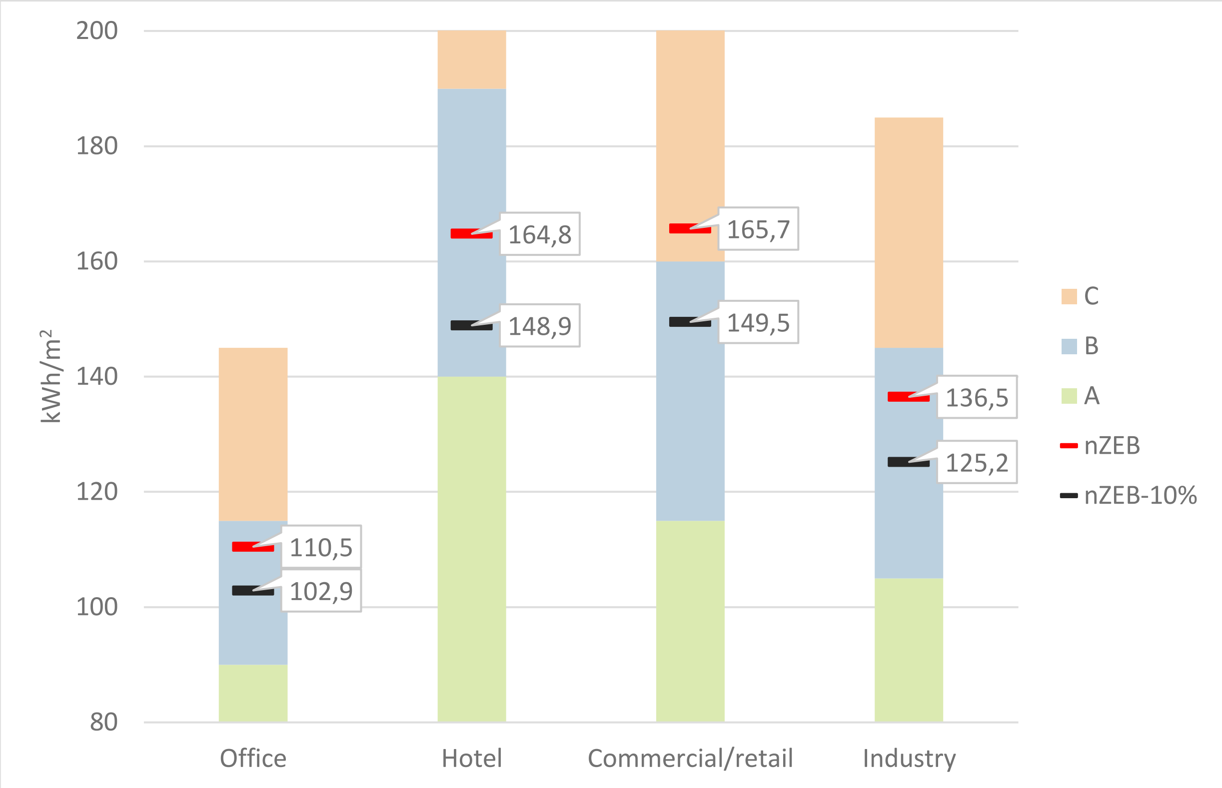

Figure 5 Energy performance with reference to the national definition of NZEB and NZEB-10 percent compared to limit values in the EPC system.

Table 9 repeats the NZEB-10 percent thresholds for each building category, applied for the portfolio.

Table 9 Maximum specific energy demand derived from the EPC-system to qualify to new build criterion, NZEB-10 percent.

Building category	NZEB-10 percent threshold
Office buildings	103 kWh/m^2
Commercial buildings/retail	150 kWh/m^2
Hotel buildings	149 kWh/m^2
Small industry and warehouses	125 kWh/m^2

The NZEB- definition is relatively straight forward to compare against the energy grades in the EPC system even for commercial buildings. For some buildings, however, there are some issues not addressed in the national NZEB-definition that potentially could differ between the two. These are not considered to be material for the assessments on a portfolio level, and minor even on an object level.

For the technicalities regarding how to include locally produced electricity, is not stated whether it includes all local power demand or only the demand included in the NZEB-definition. The thresholds in Figure 5 assumes the methodology to be in line with the EPC system and let all building related on-site consumption to reduce the calculated net delivered energy demand.

Furthermore, the EPC system gives district cooling the same efficiency factor on delivered energy as conventional locally produced cooling. This is done not to discredit a solution just as efficient due to the system boundary. The NZEB- definition does not mention district cooling and the calculation technicalities. Since the bank do not have data on cooling solutions available, and district cooling only covering a miniscule part of the cooling demand in Norway, the premise in the EPC system is assumed valid also for commercial buildings with district cooling.

3.3 Top 15 percent commercial buildings - criteria for buildings finished before December 31st 2020

The SpareBank 1 Norge-Norge criteria for existing commercial buildings identify buildings with EPC A or within the top 15 percent most energy efficient buildings in Norway as eligible. The bank has identified the eligible buildings in their portfolio, following NVE's suggested limit values per 2023 and using registered energy performance certificates or estimated energy usage from Eiendomsverdi.

3.4 Impact assessment - Commercial buildings

The eligible buildings in SpareBank 1 Nord-Norge's commercial portfolio are estimated to amount to ~138,000 square meters. One object is found eligible according to the NZEB-10 percent criterion, while 25 objects are found eligible for being in the top 15 percent in Norway.

The bank has supplied reliable information on the objects in the portfolio, including area and registered or estimated energy grade.

For the NZEB-10 percent qualifying buildings, impact is estimated by taking the difference between object specific energy demand (supplied by the bank) and the NZEB limit values from Table 9. This difference is multiplied by the emission factor and area of eligible assets to calculate impact for buildings.

For the buildings qualifying according to the top 15 percent EPC-criterion, the calculations are based on the difference between achieved energy label and weighted average in the EPC database for each building type.

Table 10 Calculated building areas for the eligible objects.

	NZEB -10 percent	Top 15 percent*	Total
Office buildings		15,317 m^2	15,317 m^2
Retail/commercial buildings	1,392 m^2	89,972 m^2	91,364 m^2
Hotel and restaurant buildings		14,154 m^2	14,154 m^2
Industry and small warehouse buildings		17,473 m^2	17,473 m^2
Sum	**1,392 m^2**	**136,916 m^2**	**138,308 m^2**

*Top 15 buildings have been identified by bank, following NVE's suggested limit values per 2023.

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 bio energy and district heating, resulting in a total specific factor of 115 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 11 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 CO_2 emissions.

Table 11 Performance of eligible objects compared to average building stock.

	Area	Reduced energy compared to baseline	Reduced CO_2 emissions compared to baseline
Eligible commercial buildings in portfolio	**138,308 m^2**	**14.3 GWh/year**	**1,636 tonnes CO_2/year**
Eligible commercial buildings in portfolio – scaled by banks engagement	**86,280 m^2**	**9.0 GWh/year**	**1,029 tonnes CO_2/year**

4 Electric vehicles

The impact of electric vehicles in Norway on climate gas emissions is assessed in the following. The bank's portfolio as of the end of December 2023 is consisting of 3,456 electric vehicles. The bank has provided data on the number of electric vehicles in the portfolio per registration year.

The identified eligible vehicles in the portfolio all align with the technical eligibility criteria formulated by Climate Bonds Initiative (CBI)[10]. The eligible EVs/ zero tailpipe emissions vehicles in the portfolio are also automatically eligible according to the climate change mitigation criteria in the EU Taxonomy Delegated Acts[11].

The 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 vehicle of the total new vehicle introduced to the market, EV's excluded.

4.1 Loan Portfolio Analysis

Related to clean transportation, the SpareBank 1 Nord-Norge Green Product Framework has several eligibility criteria for Green Financing Instruments. This report, however, investigates the electric vehicle portfolio and the relevant criterion:

- Upgrading or replacement of vehicles for land passenger and freight transport with new fully electric, hydrogen-based or otherwise zero emission technology

The portfolio examined includes solely electric vehicles financed by the bank, and the calculations include passenger vehicles, light- and heavy-duty vehicles.

4.2 General description EVs

Personal mobility in Norway is high, among the highest in Europe, with privately owned passenger vehicles accounting for most of the passenger transportation work.

Historical figures of how far the average passenger vehicle is driven annually in Norway, show a falling slope from 2007 and 2008, when the passenger vehicles peaked and were on average driven about 14,000 km. In 2022 the average passenger vehicle travelled about 11,100 km[12] in Norway. In this analysis, the expected yearly travelled distance for the vehicles in the portfolio is estimated based on an expectation of a continuing trend of reduced yearly travelled distance, and as an average in the vehicles' lifetime.

In 2022 the average age of passenger vehicles scrapped for refund in Norway was 18 years old[13]. The average age for vans scrapped in Norway was 16 years in 2022[13]. The history of modern EV's is short and there is yet no evidence for the lifetime of EV's being different from other vehicles. Due to uncertainties related to the expected lifetime of new vehicles sold between 2013 and 2023, the average lifetime for passenger vehicles and light-duty vehicles in this analysis are set to 18 and 16 years respectively, independent of fuel type. In this analysis, the average lifetime for heavy-duty vehicles is estimated to be 14 years[14], independent of fuel type.

The Norwegian government have, over time, with different administrations, had high ambitions both regarding electric vehicles and biofuel to reduce CO_2 emissions. There were almost 600,000 electric

[10] https://www.climatebonds.net/standard/transport
[11] https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en
[12] SSB Road traffic volumes, by main type of vehicle, type of fuel and age of vehicle 2005 - 2022, 2023
[13] https://www.ssb.no/en/statbank/table/05522
[14] https://www.toi.no/getfile.php?mmfileid=72976#:~:text=Varebilene %20og%20lastebilene%20lever%20i,dr%C3%B8yt%2011%20%C3%A5r%20i%20Norge.

passenger vehicles on Norwegian roads by the end of 2022, which accounts for 20 percent of the total passenger vehicle stock[15]. The Norwegian Parliament have unanimously adopted a target of 100 percent of sales of zero-emission light-duty and passenger vehicles from 2025.[16]

Since 2018, petrol retailers are obliged to sell biofuels as a defined percentage of their total sales of ordinary petroleum products. This obligation was 24.5 percent in 2023, whereof a share of minimum 12.5 percent should be advanced biofuel. 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. The overall use of advanced biofuel has increased year after year and in 2022, advanced biofuels accounted for 94 percent of the overall biofuel usage, thus reducing the usage of conventional biofuels[17]. As a result, the overall volume of biofuel has declined the past years, even though the percentage of biofuels has increased. The current government platform ("Hurdalsplattformen") strengthens the obligations to utilize second-generation biofuels in the fuels sold[18].

4.3 Climate gas emissions (Scope 1 and 2)

Categorizing the emissions, we have chosen to use the CBI guidelines for Scope 1 and Scope 2 emission calculations. CBI's *Land Transport Background Paper*[19] 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. We do, however, include indirect emissions related to power production for information.

4.3.1 Indicators

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

- Emissions per kilometre [gCO_2/km]
- Emissions per passenger kilometre [gCO_2/pkm] or tonne-kilometre [gCO_2/tkm]

The passenger vehicle fleet composition and emissions from the types of passenger 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 kilometers are calculated by multiplying the number of passengers by the corresponding number of kilometers travelled.

Statistics Norway's method for calculating indicators for emissions per passenger kilometre utilizes a vehicle occupancy of 1.7 persons in passenger vehicles and 1.5 persons in a light-duty vehicle, and these factors have been adopted in this analysis[20].

For heavy-duty vehicles, a more relevant factor is the tonne-kilometre, abbreviated as tkm. This unit represents the transportation of one tonne over one kilometre. Freight in heavy-duty vehicles in Norway is assumed to be 10.09 tonnes per vehicle, in line with Norwegian statistics[21].

15 SSB 07849: Drivstofftype, type kjøring og kjøretøygrupper (K) 2008 - 2022
16 https://www.regjeringen.no/no/tema/transport-og-kommunikasjon/veg_og_vegtrafikk/faktaartikler-vei-og-ts/norge-er-elektrisk/id2677481/
17 https://www.miljodirektoratet.no/aktuelt/nyheter/2023/mai-2023/mer-frityrolje-og-slakteavfall-pa-tanken-i-2022/
18 https://res.cloudinary.com/arbeiderpartiet/image/upload/v1/ievv_filestore/43b0da86f86a4e4bb1a8619f13de9da9afe348b29bf24fc8a319ed9b02dd284e
19 https://www.climatebonds.net/files/files/CBI_Background%20Doc_Transport_Jan2020%20.pdf page 25
20 https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/mindre-utslipp-per-kjorte-kilometer
21 https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/elbiler-reduserer-utslipp-per-personkilometer?tabell=405070

4.3.2 Direct emissions (tailpipe) - Scope 1

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

The estimation of the baseline is performed through three steps:

1. Estimating the gross CO_2-emission 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 fossil vehicles in the portfolio.

This can be described in the following equation:

$$E_{baseline} = c_{weighted\ average} \cdot d_y \cdot n_{total} = E_{avoided} \qquad (1)$$

All EVs and fuel cell vehicles are considered eligible with zero tailpipe emissions. Therefore, for 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 CO_2-emissions from fossil fuels combustion in the national vehicle fleets.

For the substituted fossil-fuelled vehicles, emission data are retrieved from recognized test methods and not actual registrations of emissions in a Nordic climate. Test methods have lately been improved to better reflect actual emissions but are still likely to underestimate the emissions[22].

Biofuels are already to some degree mixed with fossil fuels in both Norway and Sweden, and the reduced emissions due to these contributions are considered in the emissions from the vehicle that would have been bought as an alternative for the electric vehicle in this portfolio, in effect reducing the impact. As Norway aims to substantially reducing 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 2023-2030 have 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 2040, 2038 and 2036 for passenger vehicles, light-duty vehicles and heavy-duty vehicles registered in 2023, respectively.

To estimate the weighted average of emissions per fossil vehicle ($c_{weighted\ average}$) we use the average annual emission from new vehicle models from 2011-2023[23].

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 for each of the years it is used in its lifetime. Statistics of annual driven distance by electric, diesel and gasoline cars younger than 10 years builds up under this assumption[24].

Traffic volumes per passenger vehicle and light-duty vehicle have shown a historic decline and we use linear regression on publicly available datasets (d_{2005}-d_{2022}) and extrapolate until 2040. This is a conservative approach as it is likely, at some point, to see a flattening. Traffic volumes for heavy-duty vehicles have shown a similar trend, but on a higher level, with Norwegian heavy-duty vehicles driving on average 36,800 km in 2022.

[22] https://www.vegvesen.no/fag/fokusomrader/miljo+og+omgivelser/klima
[23] https://ofv.no/CO2-utslippet/co2-utslippet
[24] https://www.ssb.no/statbank/table/12578/

Table 12, Table 13 and Table 14 present the calculated direct emission factors for the relevant vehicle categories. The calculations are based on emissions statistics between 2011-2023, calculated gross tailpipe CO_2 emissions for the average vehicle produced in each of the years 2011-2023, and anticipated biofuel- and fossil fuel content in petrol/diesel pumped each year in 2023-2040.

Table 12 ***Passenger vehicles:*** *Greenhouse gas emission factors (CO2 equivalents), average direct emissions.*

	Direct emissions substituted fossil passenger vehicles – Average	Direct emissions EV
Emissions per passenger km	45 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	77 gCO_2/km	0 gCO_2/km
Emissions per passenger vehicle and year	657 $kgCO_2$/vehicle/year	0 $kgCO_2$

Table 13 ***Light-duty vehicles:*** *Greenhouse gas emission factors (CO2- equivalents), average direct emissions.*

	Direct emissions substituted fossil light-duty vehicles – Average	Direct emissions EV
Emissions per passenger km	133 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	200 gCO_2/km	0 gCO_2/km
Emissions per light-duty vehicle and year	2,231 $kgCO_2$/vehicle/year	0 $kgCO_2$

Table 14 ***Heavy-duty vehicles:*** *Greenhouse gas emission factors (CO2- equivalents), average direct emissions.*

	Direct emissions substituted fossil heavy-duty vehicles – Average	Direct emissions EV
Emissions per tonne-km	101 gCO_2/tkm	0 gCO_2/tkm
Emissions per km	1,019 gCO_2/km	0 gCO_2/km
Emissions per heavy-duty vehicle and year	34,103 $kgCO_2$/vehicle/year	0 $kgCO_2$

4.3.3 Indirect emissions (Power consumption only) - Scope 2

Power is traded internationally in an ever more 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 analysis. Using a European production mix is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[25]. We have, however, also included calculations of indirect emissions from power production setting the system boundary at national borders for comparison.

The direct emissions in power production in Europe (EU27+UK+Norway) is expected to be dramatically reduced in the coming decades. Due to urgency, a trajectory takes into consideration the 1.5 °C scenario and a substantial reduction of emissions in the power sector that will have close to zero emissions in 2050. This is in line with the EU's ambitious decarbonisation of the power sector.

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

The GHG emission intensity baseline for power consumption may be calculated with different system boundaries. The table below illustrates the CO_2-factor for the European and Norwegian production mixes as an average of the three last years with available data. These values will vary from year to year.

Table 15 Electricity production greenhouse gas factors (CO_2- equivalents). (Source: Association of Issuing Bodies, Multiconsult)

Scenario	CO_2 emission factor
European (EU27+UK+Norway) production mix average 2020 - 2022	241 gCO_2/kWh
Norwegian production mix average 2020 - 2022	6.4 gCO_2/kWh

The following calculations use the CO_2- factor as an average from a baseline in 2022 (the production mixes in Table 15) and the expected lifetime for each type of vehicle. E.g., for European production mix and passenger vehicles, with an expected lifetime of 18 years, the reduction over the vehicle's lifetime gives the applied average factor of 168 gCO_2/kWh. The projected trajectories for declining CO_2 emissions related to power production for EU and Norway, from 2023 and forward, will impact the indirect emissions and avoided emissions from the vehicle portfolio.

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, we are using the average for all currently available EV models in the Electrical Vehicle Database[26], 0.195 kWh/km, which is close to the factor presented in the Swedish "Handbok för vägtrafikens luftföroreningar"[27]. This factor has been used in the analysis. The same handbook presents an energy consumption for light-duty vehicles of 0.25 kWh/km. For heavy-duty vehicles, the factor 1.25 kWh/km, an average for recent EV trucks has been used[28].

In Table 16 and

Table 17, indirect emission factors are presented in both emissions per kilometre and per passenger-kilometre or tonne-kilometre.

Table 16 Annual average electricity consumption greenhouse gas factors (CO2- equivalents) electric vehicles-based on ***EU + UK + NO*** *power production mix*.*

	Electric passenger vehicle	Electric light-duty vehicle	Electric heavy-duty vehicle
Emissions per passenger-km or tonne-km, indirect emissions from power production*	19 gCO_2/pkm	30 gCO_2/pkm	23 gCO_2/tkm
Emissions per km, indirect emissions from power production	33 gCO_2/km	44 gCO_2/km	231 gCO_2/km

[26] https://ev-database.org/cheatsheet/energy-consumption-electric-car
[27] Handbok för vägtrafikens luftföroreningar, chapter 6, Trafikverket, 2019
[28] https://www.toi.no/publikasjoner/gronn-lastebiltransport-teknologistatus-kostnader-og-brukererfaringer, 2021

Table 17 Annual average electricity consumption greenhouse gas factors (CO2- equivalents) electric vehicles-based on ***Norwegian*** *power production mix*.*

	Electric passenger vehicle	Electric light-duty vehicle	Electric heavy-duty vehicle
Emissions per passenger-km or tonne-km, indirect emissions from power production*	0.5 gCO_2/pkm	0.8 gCO_2/pkm	0.6 gCO_2/tkm
Emissions per km, indirect emissions from power production	0.9 gCO_2/km	1.2 gCO_2/km	6.3 gCO_2/km

*Note that there are indirect emissions related to fossil fuel as well, but these are scope 3 emissions and 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. Indirect emissions related to fossil fuelled vehicles are zero for scope 2.

4.4 Impact assessment – Clean transportation

The 3,456 eligible vehicles in SpareBank 1 Nord-Norge's FY23 portfolio are estimated to drive 29.6 million kilometres in a year. The available data from the bank include the current number of contracts and related portfolio volume.

Table 18 Number of eligible passenger vehicles and expected yearly mileage.

	No. of vehicles	Sum km/year	Sum passenger-km/year or tonne-km/year
Passenger vehicles	3,368	28.6 mill.	48.7 mill.
Light-duty vehicles	86	0.96 mill.	1.4 mill.
Heavy-duty vehicles	2	67,000	0.68 mill.
Sum portfolio	**3,456**	**29.6 mill.**	**50.8 mill.**

Table 19 and Table 20 summarises the lower CO_2-emissions compared to baseline for the eligible assets in the portfolio in an average year in the lifetime of the vehicles in the portfolio, presented as reductions in direct emissions and indirect emissions in rounded numbers. Table 19 present results based on European power production mix, and Table 20 for Norwegian production mix for vehicles belonging to the respective countries. Note that the indirect emissions are only calculated for EV's and not fossil fuelled vehicles.

Direct emissions in the following tables are calculated by multiplying distance travelled by the vehicles in the portfolio in a year from Table 18, by the specific emission factors [gCO_2/km] in Table 12 through Table 14. Indirect emissions are calculated by multiplying distance travelled by the vehicles in the portfolio in a year by the specific emission factors [gCO_2/km] in Table 16 and

Table 17 for European and Norwegian production mixes, respectively.

Table 19 The EV portfolio's estimated impact on direct, indirect and avoided GHG emissions in rounded numbers, indirect emissions based on European production mix.

Eligible passenger vehicles	CO_2 emissions avoided compared to baseline
Direct emissions only (Scope 1)	2,474 tonnes CO_2/year
Indirect emissions only (Scope 2, EU mix)	- 996 tonnes CO_2/year
Sum direct and indirect	**1,478 tonnes CO_2/year**

Table 20 The EV portfolio's estimated impact on direct, indirect and avoided GHG emissions in rounded numbers, indirect emissions based on Norwegian production mix.

Eligible passenger vehicles	CO_2 emissions avoided compared to baseline
Direct emissions only (Scope 1)	2,474 tonnes CO_2/year
Indirect emissions only (Scope 2, EU mix)	- 27 tonnes CO_2/year
Sum direct and indirect	**2,447 tonnes CO_2/year**

The reduction in direct emissions from the vehicles in the portfolio corresponds to 1 million litres of gasoline saved per year.

5 Renewable energy

Hydropower is the clearly dominant power production solution in Norway and has been for over 100 years since the beginning of the industrialisation. Today, hydropower remains a crucial component of the national energy mix, accounting for 89 percent of the national electricity production in 2023. The same year, onshore wind accounted for 9 percent of the national power production[31]. Solar power plants are currently being introduced to the Norwegian power sector, with the first ground mounted plant connected to the grid in 2023.

Power production development in Norway is strictly regulated and subject to licencing and is overseen by the Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of 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 for different kinds of projects[29].

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

5.1 Eligibility

The SpareBank 1 Nord-Norge's Green Product Framework includes the development, operation, and maintenance of electricity generation from solar power, wind power, geothermal power, and hydroelectric power.

The EU Taxonomy's "Do no significant harm" (DNSH) criteria for both hydropower and wind, 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 rigid relevant requirements in the Norwegian regulation of energy plants. All Norwegian wind and hydropower assets conform to very high standards regarding environmental and social impact. Portfolio alignment with DNSH requirements has not been assessed in detail.

Hydro power

The green loan portfolio of SpareBank 1 Nord-Norge assessed in this report contains hydropower plants that meet the framework criteria as formulated as:

- The energy generation facility is a run of river plant and does not have an artificial reservoir
- The power density of the electricity generation facility is above 5 W/m^2
- The lifecycle emissions from the generation of the electricity are lower than 100 gCO_2/kWh

The eligibility criteria are formulated in line with CBI criteria[30], and the threshold is in line with the emissions threshold of 100 gCO_2e/kWh in the June 2021 EU Taxonomy Annex I to the Commission Delegated Regulation[31].

Hydropower plants with power density > 5 W/m^2 are exempt from the most detailed investigations.

29 https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
30 https://www.climatebonds.net/standard/hydropower
31 https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf

For Norwegian hydropower assets, 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, Norwegian reservoirs are not exposed to cyclic revegetation of impoundment, and hence the negative impacts on GHG emissions from these reservoirs are very small
- Hydropower stations with high hydraulic head and/or relatively small impounded areas have high power density

Wind power

The green loan portfolio of SpareBank 1 Nord-Norge assessed in this report contains onshore wind power plants that meet the framework criteria as formulated as:

- Onshore and offshore wind energy generation facilities and other emerging technologies, such as wind tunnels and cubes

According to the CBI wind eligibility criteria[32], onshore wind energy generation facilities are automatically eligible. All onshore Norwegian wind power plants in the portfolio thus fulfil this criterion.

5.2 Eligible assets in the portfolio

SpareBank 1 Nord-Norge's eligible assets have low to negligible GHG emissions related to construction and operation of the renewable power plants, something Multiconsult can verify.

SpareBank 1 Nord-Norge's portfolio contain wind power plants in the range of 2.4-41 MW and hydropower stations with capacities in the range of 1.4-23 MW. The hydropower plants are run-of-river plants or hydropower plants with small reservoirs and hence have higher power density of several thousand W/m^2 (ratio between capacity and impounded area) and are eligible for green bonds. The onshore wind power plants are also eligible.

5.3 Impact assessment- Renewable energy

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 impact on GHG emissions for all, and most of them rather small facilities in the SpareBank 1 Nord-Norge's portfolio, we refer to The Association of Issuing Bodies (AIB). AIB is responsible for developing and promoting the European Energy Certificate System – "EECS".

AIB, as referred to by NVE[33], uses 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 all assets, even though they are higher than factors in other credible sources. E.g. Østfoldforskning[34] has calculated the life-cycle emissions of Norwegian hydropower (all categories) to 3.33 gCO_2e/kWh. For the type of assets in the portfolio, with many run-of-river and small hydropower assets, the AIB emission factor is regarded as

[32] https://www.climatebonds.net/standard/wind
[33] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/
[34] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf

conservative in an impact assessment setting. The positive impact of the hydropower assets is 130 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh.

The equivalent emission factor for wind power is by AIB set at 20 gCO_2/kWh. The positive impact of the wind power assets in SpareBank 1 Nord-Norge's portfolio is then 116 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh.

5.3.2 Power production estimates

The renewable energy power plants in SpareBank 1 Nord-Norge's portfolio are quite varied in age. A large portion of younger plants add uncertainty to the future power production. Planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's hydropower database[35], wind power database[36] and licensing documents[37].

It is important to note that indicated power production capacity in the licensing documents do 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 has shown that actual production often is more than 20 percent lower than the licensing/pre-construction figures. There is no equivalent evidence to claim the same mismatch for large hydropower or wind power.

5.3.3 New or existing Norwegian renewable energy plants

The eligible plants in SpareBank 1 Nord-Norge's portfolio have a planned capacity stated in licensing documents to produce about 1,239 GWh per year. In the impact assessment this has been adjusted to an expected 991 GWh based on research mentioned in the previous section. The available data from the bank and in open sources include:

- Type of plant
- Installed capacity
- Planned annual production

The planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's energy production databases or licencing documents. Due to the often-overestimated annual production in small hydropower, the impact for the 71 hydropower plants smaller than 10 MW is conservatively calculated by reducing the estimated production by 20 percent.

Table 21 shows the capacity, number of plants, estimated and expected production for the assets in SpareBank 1 Nord-Norge's portfolio.

[35] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/, 2024
[36] https://www.nve.no/energi/energisystem/vindkraft/data-for-utbygde-vindkraftverk-i-norge/, 2024
[37] https://www.nve.no/konsesjon/konsesjonssaker/, 2024

Table 21 Capacity and production of eligible hydropower plants and wind power plants, estimated and expected production.

	Capacity [MW]	No. of plants	Total capacity [MW]	Estimated production [GWh/year]	Expected production [GWh/year]
Small hydropower	1.4-23	75	334	1,027	870
Wind power	2.4-41	4	63	212	212
Total			**397**	**1,239**	**1,082**

Table 22 summarises the expected renewable energy produced by the eligible assets in the portfolio in an average year and the resulting avoided CO_2 emissions the energy production results in. The table also includes the total expected production and avoided emissions scaled by the bank's share of financing.

Table 22 Power production and estimated positive impact on GHG-emissions.

	Expected production	Reduced CO_2 emissions compared to baseline
Eligible hydropower plants in portfolio	870 GWh/year	113,082 tonnes CO_2/year
Eligible wind power plants in portfolio	212 GWh/year	25,569 tonnes CO_2/year
Total	**1,082 GWh/year**	**137,651 tonnes CO_2/year**
Total – scaled by bank's share of financing	**214 GWh/year**	**27,405 tonnes CO_2/year**