VW Immobilien Green Bond

Assessment Methodology Germany

Client
Volkswagen Immobilien GmbH
Poststraße 28
38440 Wolfsburg

Author
Drees & Sommer Advanced Building Technologies GmbH
Obere Waldplätze 11
70569 Stuttgart

Johannes Hopf /Jens Kühlbrey
Tel: +49 711 687070 -3037
Fax: +49 711 687070-368
johannes.hopf@dreso.com

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1 Background

In Germany, 32 % (779 TWh) of the national site energy use is caused by buildings and 63 % of this is accounted for by residential buildings (approx. 18.7 million buildings) and 37 % by non-residential buildings[1] (approx. 300,000 office buildings)[2]. Conversely, this means that the energy use of buildings are one of the main CO_2 emitters.

The biggest challenge in the development of a Green Bond assessment methodology for the selection of German buildings was to find a suitable data basis for the energy consumption of the building stock depending on the building age. Other countries such as the Netherlands or the USA demonstrate how a maximum degree of transparency for building energy performance in existing buildings can be achieved. With the energy performance certificates (EPC) of the EnEV, there is already an excellent instrument in Germany for the energetic evaluation of buildings. However, there is still a lack of a central national register in which the results of the energy performance certificates are mandatory. Such a data basis would eliminate the need for approaches such as those outlined in this paper.

2 German Real Estate Assessment Methodology

The aim of the initial building selection is to develop an easily applicable but nevertheless reliable assessment methodology with a limited amount of data (e.g. no energy consumption data of the buildings available).

The VW Immobilien GmbH objective is to identify a portfolio that is aligned with the guideline of Climate Bonds Initiative (CBI) to ensure that the carbon performance of the selected buildings is among the top 15 % of the local building stock. The building selection therefore relates primarily to the energy efficiency of buildings and not to the existence of green building certificates, as this has already been the case with the issuance of other Green Bonds. The procedure is divided into two parts:

In a first step, the building will be selected according to conservative criteria based on the building age and current energy legislation. This approach is conservative, since only new buildings with a good quality building envelope are accepted. However, no statements can be made about the actual energetic performance. Significant deviations may result from improper use and operation of the technical equipment. Energy-efficient old buildings are also excluded. In the second step, measured consumption data is therefore used for selection. This is essential to know the actual CO2 emissions of buildings in Germany. In order to meet the COP21 targets, actual emissions in tonnes of CO2 are important and not the quality of the building envelope.

[1] dena-Gebäudereport 2016 Statistiken und Analysen zur Energieeffizienz im Gebäudebestand;11/2016

[2] dena-Studie Büroimmobilien Energetischer Zustand und Anreize zur Steigerung der Energieeffizienz; 05/2017

Since the measured energy consumptions[3] are not yet available, the energy performance of the buildings is now evaluated according to the theoretical energy demand[4]. In Germany, energy demand has been determined since 2007 according to the same basic method, only the target values have been gradually tightened. For this purpose, the buildings energy demands are calculated using a standardized calculation method in accordance with DIN V 18599[5] or for residential buildings in accordance with DIN 4108 and an energy performance certificate according to EnEV[6] is issued on this basis. Thus, the German government is implementing the European Building Directive EPBD[7], which applies to all EU member states. The relationships between the various legal requirements can be seen in Figure 1.

The conservative approach for the selection of German residential, office, logistic and industrial buildings built under a certain standard ensures that these buildings will be among the top 15 % (and even significantly better than the top 15 %). As the energy quality of the buildings has been continuously improved, the building year is a reliable criterion for the selection method of the top 15 % of German residential, office, logistic and industrial buildings.

In the second step, the actual energy consumption and related carbon emissions are evaluated.

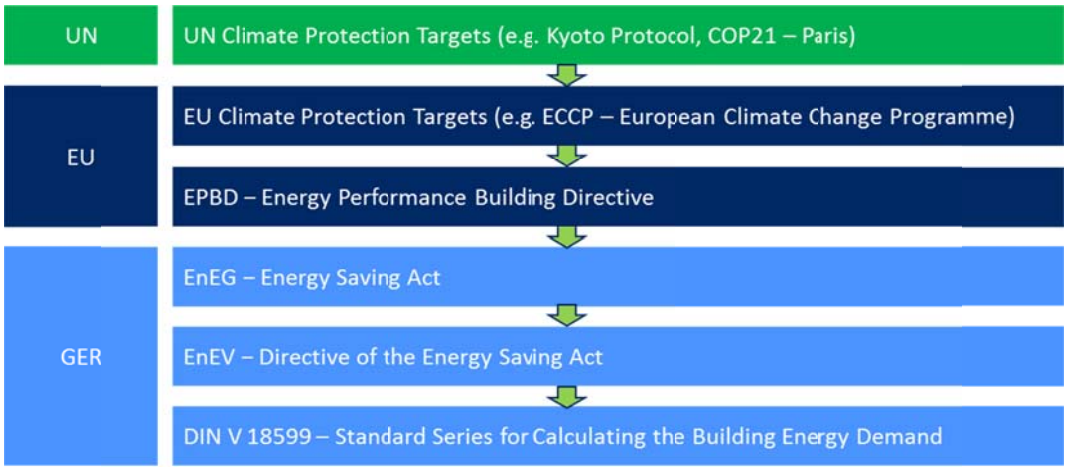

Figure 1: Legal requirements from UN to national level

The assessment methodology is based on statistical data and local laws and regulations. Years of statistics and the entry into force of laws often do not coincide. For the sake of simplicity, for example, the year of construction 2009 was equated with the entry into force of the EnEV 2009. Knowing that there is a certain degree of blurriness here.

[3] Energy consumption: Actual measured energy consumption which has to be paid

[4] Energy demand: Theoretical determined energy requirement which is usually calculated within the design phase under normalized conditions

[5] DIN V 18599 – Standard series for calculating the building energy demand

[6] EnEV – Energieeinsparverordnung (Directive of the Energy Saving Act / EnEG)

[7] EPBD – Energy Performance of Buildings Directive

3 Eligibility Criteria for German Residential Buildings

The following criteria are each individually suitable for reaching the top 15% of the German construction market. This means that a property is eligible for the program if it meets one of the criteria

3.1 Buildings fulfilling EnEV 2009

To obtain the top 15 % of the local German market of residential buildings the existing building stock has to be determined and the energy efficiency has to be investigated. The following figure shows the heat energy demand respectively the heat energy use of residential buildings depending on the year of construction. It is shown that until now the heat energy demand and use are decreasing. Furthermore, the energy demand of buildings built in 2009 or later is more than 75 % lower than the energy demand of buildings built before 1948.

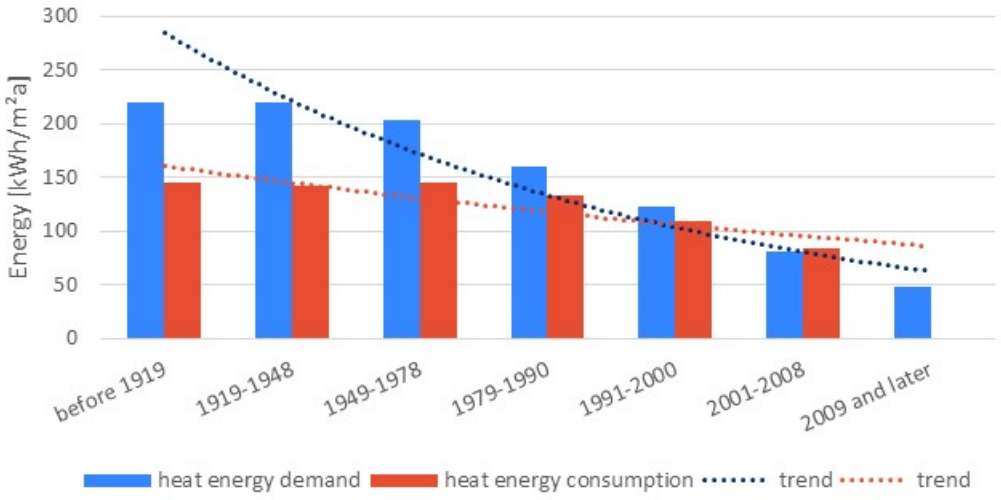

Figure 2: Heat energy performance of German residential buildings (reference: dena[8])

According to dena statistics, as shown in the following figure, 3% of all existing residential buildings were constructed in 2009 and later. Inferring from the energy demand discussed above, it can be deduced from the buildings built in 2009 that they achieve the highest quality of energy efficiency.

As a result, all buildings meeting the EnEV 2009 can be assigned to the top 15% buildings of the local market. Note that EnEV 2009 has come into force in October 2009.

[8] dena: Deutsche Energie-Agentur (German Energy Agency)

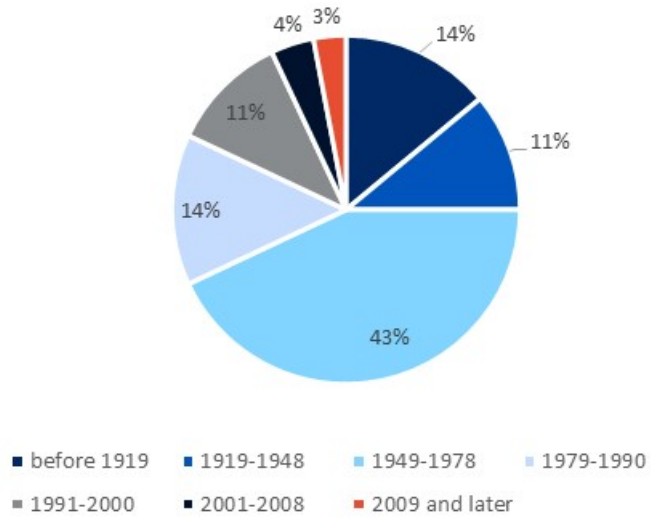

Figure 3: Relative frequency of German residential buildings according to building age classes (reference: dena)

Eligibility criteria

– New building meeting the EnEV 2009 and later requirements proven by a demand based EPC (DIN V 18599 calculation)

3.2 Energy efficiency classes

Over the existing building stock of all German residential buildings the top 15 % of the local market are nearly 3 million buildings[8]. To identify these buildings a classification is set by the energy efficiency classes, used in the EPC by the energy saving regulation (EnEV)[9]. Each building can be classified to categories from “A+” to “H”. The following figure shows the maximum threshold of each class. Buildings with a heat energy demand of 300 kWh/m²a and more is categorized in class “H”.

[9] EnEV: Energieeinsparverordnung

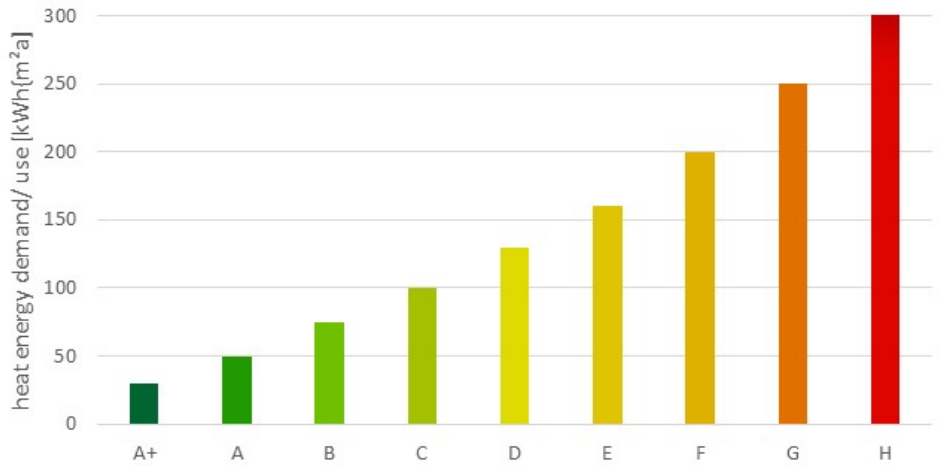

Figure 4: Residential energy efficiency classes (reference: Energieeinsparverordnung EnEV Anlage 10)

The rating is carried out regardless whether it is a demand value or consumption value.

In the figure below the dena building report 2016 describes the allocation of the German residential buildings in energy efficiency classes. The residential building stock of the top 15 % of the local market can be constituted by classes “A+” to “B”.

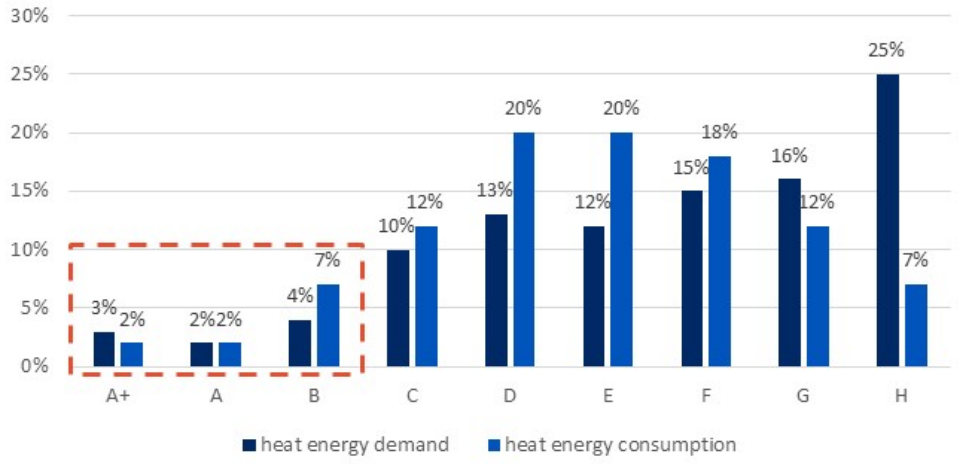

Figure 5: Allocation of energy efficiency of existing German residential buildings (reference: dena)

Buildings with an energy efficiency class of A+, A or B based on the theoretical energy demand make up 9 % of the local market. Based on the actual energy consumption classes A+, A and B make up 11 % of the local market. All building belonging to the energy efficiency classes A+, A and B belong to the top 15 % of the local market. Old or refurbished buildings that meet these classes are eligible.

Eligibility criteria

– New, refurbished or existing building meeting energy efficiency classes A+, A, B

3.3 Refurbished buildings

Refurbished buildings are same as new constructed buildings legally obliged to follow the requirements of the current applicable EnEV. The EnEV permits a 40% overrun of the source energy target value of a new building.

With 1%, the yearly rehabilitation rate in Germany is very low[10]. Therefore, it can be assumed that the actual number of buildings is very small. In addition, as already explained above, the amount of buildings according to EnEV 2009 is 3%. Therefore, it can be assumed that rehabilitated residential buildings meeting the EnEV 2009 are among the top 15% of the local market.

Refurbished buildings might also meet the requirements of energy efficiency classes – see chapter 3.2.

Eligibility criteria

- Refurbished building meets energy efficiency class A+, A, B
- Rehabilitated building exceeds the new building's energy target by a maximum of 40%.

3.4 Certified Green Buildings (LEED, BREEAM, DGNB, Blue Buildings)

Green Building certifications like LEED, BREEAM or DGNB have a broad scope on sustainability. They cover more than just energy efficiency. All labels certify buildings in various levels with Platinum being the best and Silver being the basis.

Only few buildings have a green building certification. Certificates for new buildings must be distinguished from existing buildings. Construction quality and energy efficiency are assessed in new buildings. In existing buildings, the operation and operational processes are evaluated. Energy efficiency is assessed only marginally. We recommend using only new building certificates as selection criteria.

Eligibility criteria

- Volkswagen Immobilien Blue Building Standard[1] and Blue Building Plus
- DGNB “Silver”, NWO09 and later

[10] dena – Gebäudereport 2016

[1] Blue Building is an internal certification. Blue Building sets the requirements for thermal comfort, visual comfort, acoustic comfort, opportunity for individual tenants to control local environment, availability and design of outdoor space, and a link to nearby community facilities.

4 Eligibility Criteria for German Office Buildings

The following criteria are suitable to to be withing the top 15 % of the German building market:

4.1 Buildings fulfilling EnEV 2007

To obtain information on carbon performance, correlated with energy performance, of the top 15% of German office buildings[11], a data basis is required that includes both specific energy data and the associated building age classes. The dena[12] study "Office properties - energy efficiency and incentives for increasing energy efficiency"[13] contains for the first time this information for office buildings and will therefore be used. The following figure of the study shows the correlation between increasing energy efficiency and later building age class for office buildings.

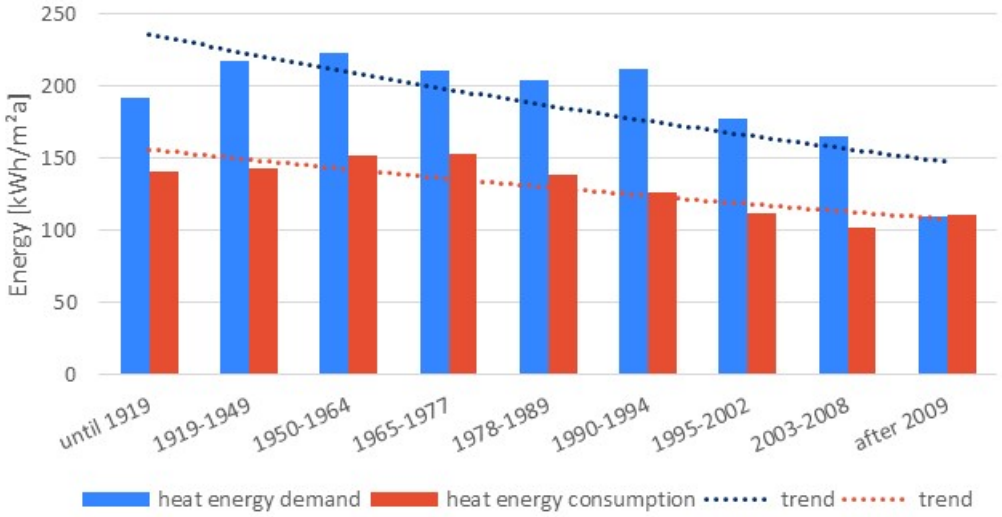

Figure 6: Heat Energy Performance of German Office Buildings (reference: dena)

Together with the allocation of buildings according to building age class (i. e. when and how many new buildings were erected, see Figure 7) the top 15 % can be clearly distinguished. Due to the low rate of new construction, all office buildings with the building age class 1995-2002 and younger belong on average to the top 15 % of German office buildings. Only few percent of the building age class 1995 – 2002 fill up 15 % of the local market. Buildings 2002 and younger make up nearly 10 % of the market. As conservative approach we choose to select building meeting 2007´s EnEV requirements.

[11] The assessment approach takes as a basis that the local building market is mainly supplied with similar primary energy sources.

[12] dena – Deutsche Energie-Agentur (German Energy Agency)

[13] dena – Studie Büroimmobilien Energetischer Zustand und Anreize zur Steigerung der Energieeffizienz; 05/2017

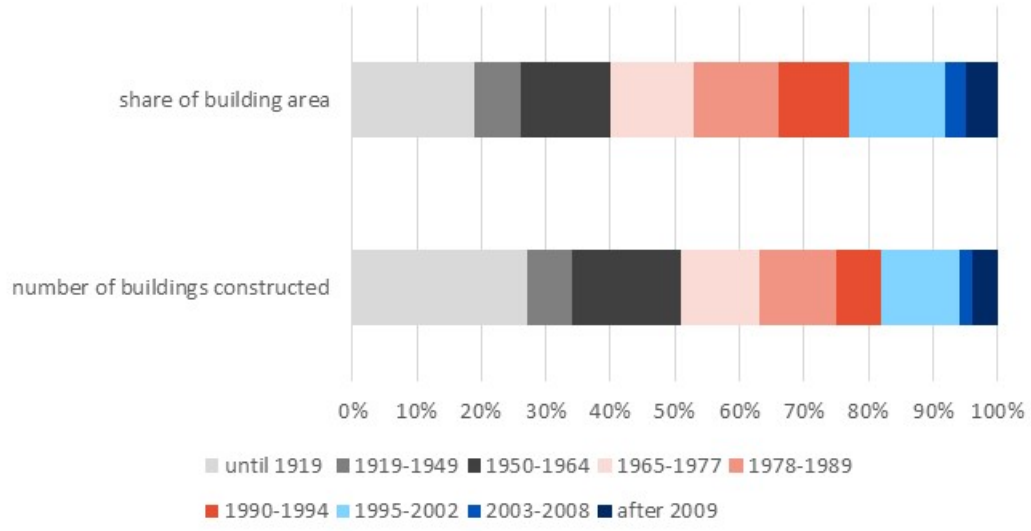

Figure 7: Number and Share of New Constructed German Office Buildings (reference: dena)

Eligibility criteria

– Building meets the EnEV 2007 and later requirements proven by a demand based EPC (DIN V 18599 calculation)

4.2 Older or Refurbished Buildings

Refurbished buildings are same as new constructed buildings legally obliged to follow the requirements of the current applicable EnEV.

The EnEV permits a 40% overrun of the source energy target value of a new building.

Eligibility criteria

– Renovated building exceeds the new building's energy target EnEV 2009 by a maximum of 40%.
– Old or renovated office buildings maximum site energy consumption of 120 kWh/m²/a

4.3 Certified Green Buildings (LEED, BREEAM, DGNB)

Only few buildings have a green building certification. Certificates for new buildings must be distinguished from existing buildings. Construction quality and energy efficiency are assessed in new buildings. In existing buildings, the operation and operational processes are evaluated. Energy efficiency is assessed only marginally. We recommend using only new building certificates as selection criteria.

Eligibility criteria

- Blue Building and Blue Building Plus,
- LEED “Gold “ NC or CS v3 and later,
- DGNB “Silver”, NBV09 and later
- BREEAM “Very Good”,
- ENERGY STAR “85“

5 Eligibility Criteria for German Logistic Buildings

5.1 Buildings fulfilling EnEV 2009

The current available energy data of logistic buildings is extremely poor. Logistic buildings have a very widespread field of use. Four main categories are obvious

- Deep freeze warehouses
- Unheated warehouses (> 5 °C indoor temperature)
- Semi-heated warehouses (12 - 18 °C indoor temperature)
- Fully heated warehouses (> 20 °C indoor temperature)

Therefore, it is not possible to define a clear threshold of energy demand to compare the energy demand of the logistic buildings of VW Immobilien portfolio with the energy demand of the whole German logistic building portfolio. Due to very limited number of statistics no correlation between building age class and energy efficiency of logistic buildings can be made.

Nevertheless, the fm.benchmarking report 2017[14] allocates all existing logistic buildings in the year of construction as shown in the following figure. 35 % of all existing buildings are erected after the year 2000.

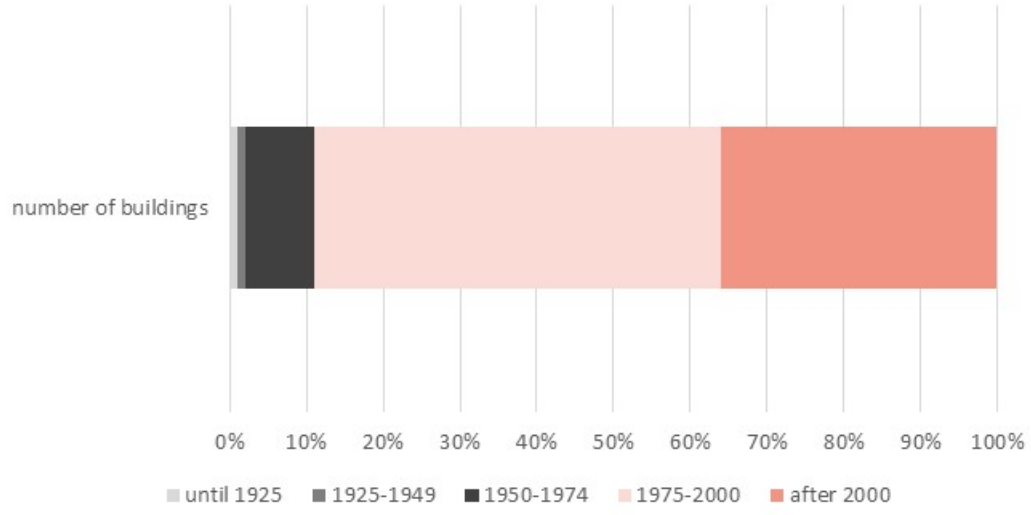

Figure 8: Number of new constructed German logistic buildings (reference: fm.benchmarking report 2017)

This trend is confirmend by the "Gesamtanalyse Energieeffizenz von Hallengebäuden" GAEEH, a 2011 study from ITG Dresden Kassel University. Out of 320,000 relevant buildings 120,000 were built in the last 17 years which makes up 37,5 % (comparable to fm.benchmarking study 2000-2017 = 35 %).

[14] fm.benchmarking Bericht 2017; Prof. Uwe Rotermund, Ingenieurgesellschaft mbH & Co KG

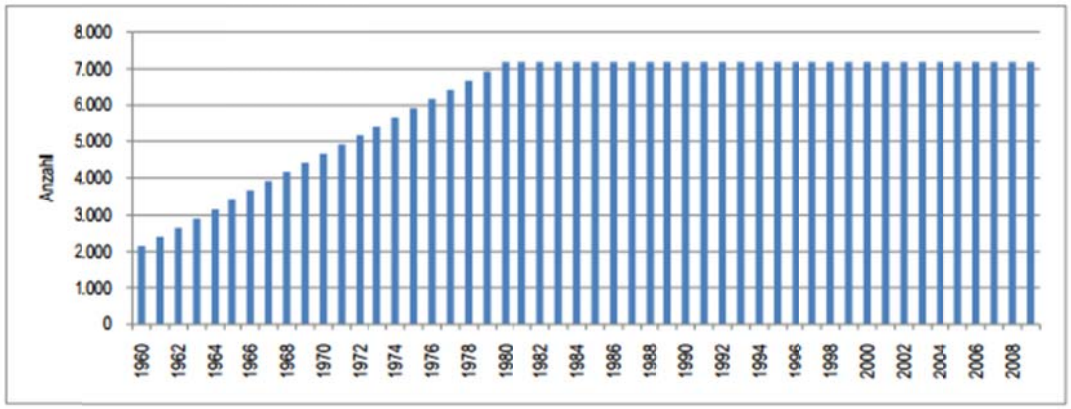

Figure 9: Number of new constructed logistic buildings between 1960 and 2008. Source: GAEEH - Endbericht.

A conservative approach would be that between 2000 and 2018 35 % were built, that corresponds to 2 % per year (average). 15 % of the local market were built between 2011 and 2018. Taking into account a strong increase in demand for logistics property, the newest 15 % of the logistics market must have been built 2011 and later, that means under EnEV2009 and later.

Because of increasing requirements in the energy efficiency of buildings, regulated by the German energy savings regulation (EnEV), a higher level of energy efficiency of new constructed buildings is expected. The following figure shows the increasing requirements made by the released energy savings regulations from 1995 to 2009. It describes the maximum / mean u value (heat transfer coefficient) of external walls and roofs of buildings. The u value has a high impact on the buildings energy efficiency. The lower it gets the better the energy efficiency. EnEV 2009 has the most stringent requirements regarding U-values since now.

The requirements for external walls increased by over 50 %, for flat roofs by 13 to 33 %.

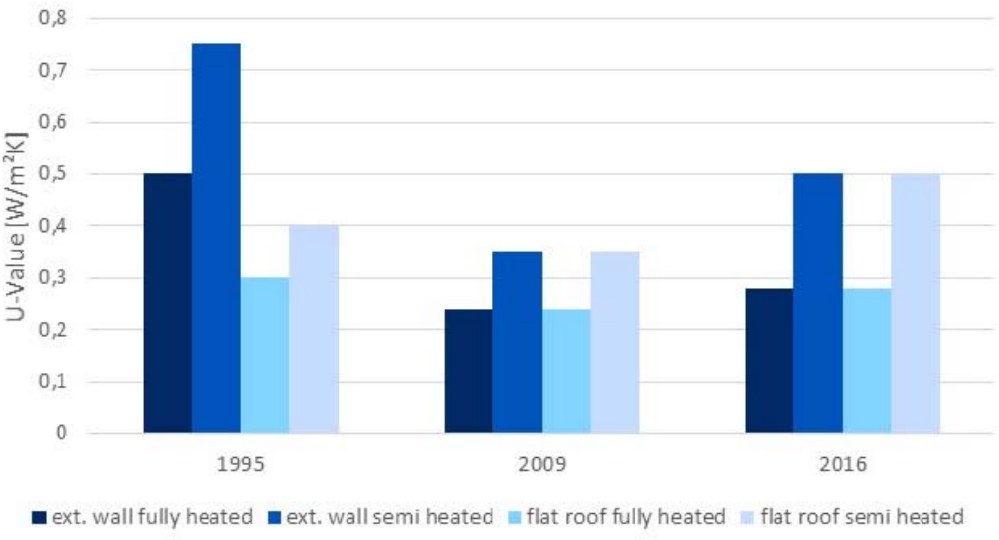

Figure 10: Requirements of the u value of walls and flat roofs; WSchV1995/ EnEV 2009: (reference: Wärmeschutzverordnung 1995, EnEV 2009)

A case study for a standard Volkswagen-Immobilien logistics object shows, that the energy demand calculated under DIN V 18599 decreases by 10 % from Wärmeschutzverordnung 1995 to Energieeinsparverordnung 2009. After EnEV 2009 requirements didn't increase.

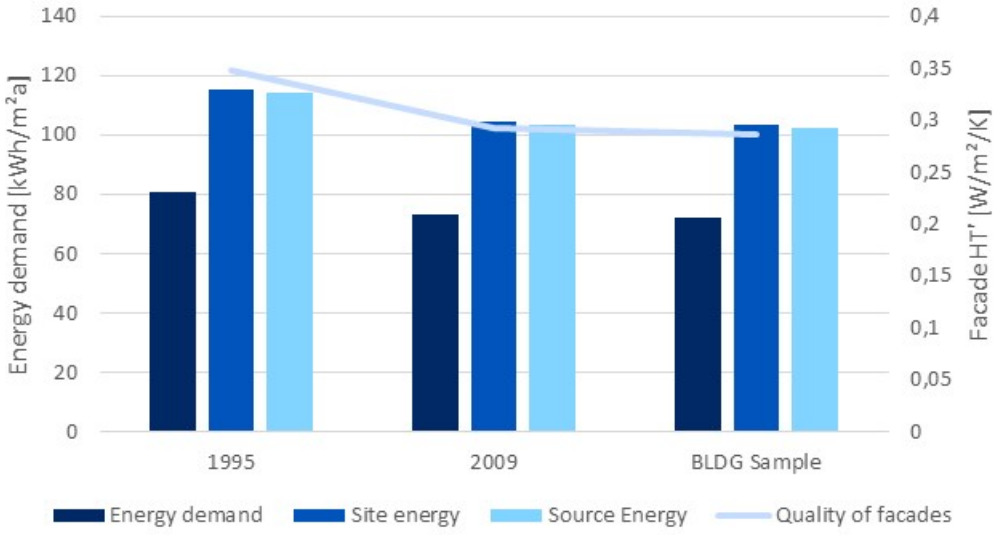

Figure 11: Increased energy requirements result in lower energy consumption and a better building envelope

Eligibility criteria

– Building meets the EnEV 2009 and later requirements proven by a demand based EPC (DIN V 18599 calculation)

5.2 Older or Refurbished Buildings

Refurbished buildings are same as new constructed buildings legally obliged to follow the requirements of the current applicable EnEV.

The EnEV permits a 40% overrun of the source energy target value of a new building.

Eligibility criteria

– Renovated building exceeds the new building's energy target by a maximum of 40%.

5.3 Certified Green Buildings (LEED, BREEAM, DGNB)

Only few buildings have a green building certification. Certificates for new buildings must be distinguished from existing buildings. Construction quality and energy efficiency are assessed in new buildings. In existing buildings, the operation and operational processes are evaluated. Energy efficiency is assessed only marginally. We recommend using only new building certificates as selection criteria.

Eligibility criteria

- Blue Building and Blue Building Plus
- LEED “Gold“,
- DGNB “Silver” NIN09 and later,
- BREEAM “Very Good”,

6 Eligibility Criteria for Slovakian Logistics Buildings

6.1 Buildings fulfilling EnEV 2009 (according to German logistic buildings)

VW-I also intends to integrate a logistics property in Slovakia. The data situation is even worse for the Slovakian market. However, the following illustration shows that the climatic conditions are very comparable. Slovakia as EU-member state has to fulfill the same EU energy directives. We therefore recommend using the same boundary conditions for selection.

For all calculations under German EnEV or DIN V 18599 weather data for TRY 4 – Potsdam (test reference year) is decisive. For randomly chosen years 1997, 2010 and 2016 no significant deviations were detected.

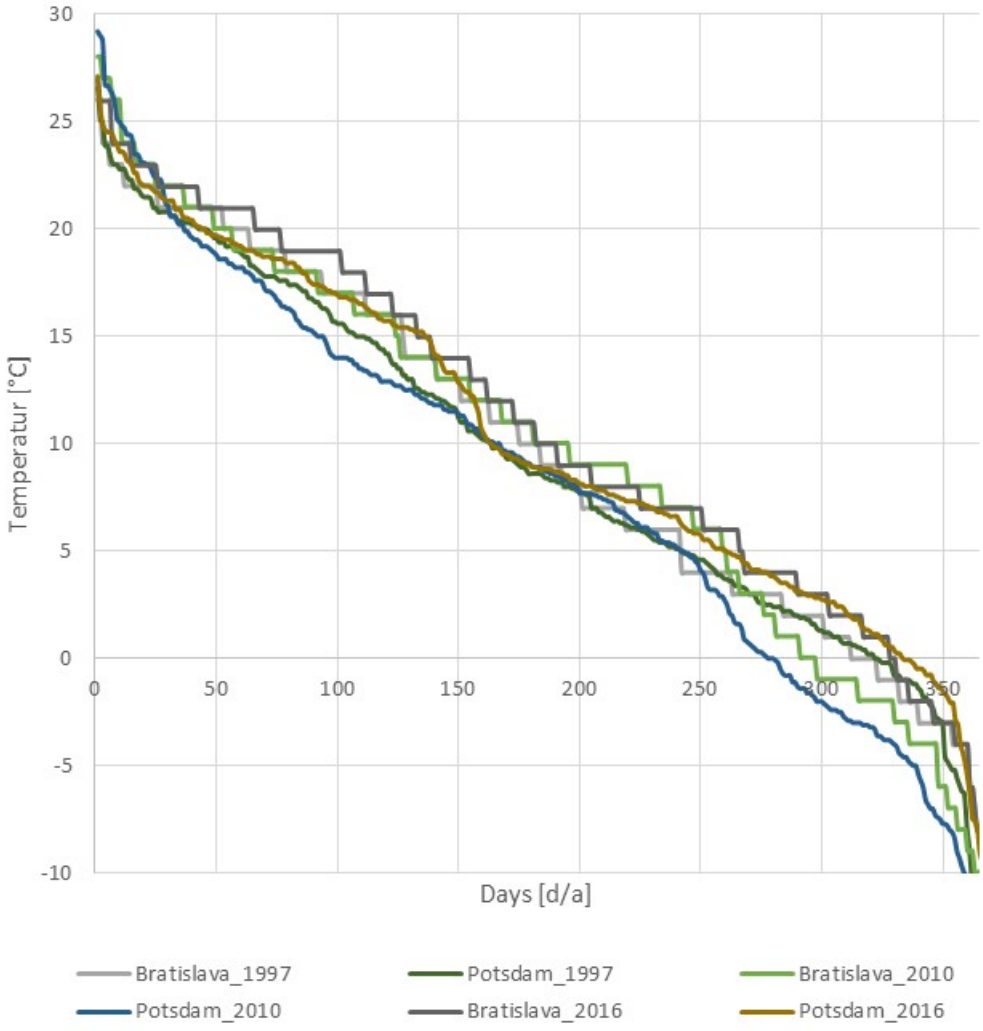

Figure 12: Comparison of daily mean temperatures

Eligibility criteria

– Building meets the EnEV 2009 and later requirements proven by a demand based EPC (DIN V 18599 calculation) or comparable Slovakian standard

6.2 Older or Refurbished Buildings

Refurbished buildings are same as new constructed buildings legally obliged to follow the requirements of the current applicable EnEV.

The EnEV permits a 40% overrun of the source energy target value of a new building.

Eligibility criteria

– Renovated building exceeds the new building's energy target by a maximum of 40%.

6.3 Certified Green Buildings (LEED, BREEAM, DGNB)

Only few buildings have a green building certification. Certificates for new buildings must be distinguished from existing buildings. Construction quality and energy efficiency are assessed in new buildings. In existing buildings, the operation and operational processes are evaluated. Energy efficiency is assessed only marginally. We recommend using only new building certificates as selection criteria.

Eligibility criteria

– LEED “Gold“,
– DGNB “Silver” NIN09 and later,
– BREEAM “Very Good”,

7 Overview

The following table summarized all possible selection criteria. Please see the detailed description in each chapter to explain the reference (e.g. energy demand or consumption, site or source energy etc.)

	Energy Efficiency Class	EnEV	EnEV	Other Label
New/Existing Buildings	✓	✓		✓
Renovated/ Refurbished Buildings	✓		✓	
Residential DE	A+, A, B	EnEV 2009	EnEV 2009 + 40 %	Blue Building, Blue Building Plus DGNB „Silver“ NWO09
Office DE	< 120 kWh/m²a	EnEV 2007	EnEV 2009 + 40 %	Blue Building, Blue Building Plus LEED “Gold “ NC or CS v3 DGNB “Silver”, NBV09 BREEAM “Very Good” ENERGY STAR “85“
Logistics DE		EnEV 2009	EnEV 2009 + 40 %	Blue Building, Blue Building Plus LEED “Gold “ NC or CS v3 DGNB “Silver” NIN09 BREEAM “Very Good”
Logistics SVK		EnEV 2009	EnEV 2009 + 40 %	LEED “Gold “ NC or CS v3 DGNB “Silver” NIN09 BREEAM “Very Good”

8 VW-I Portfolio and Building Selection

8.1 Portfolio Overview

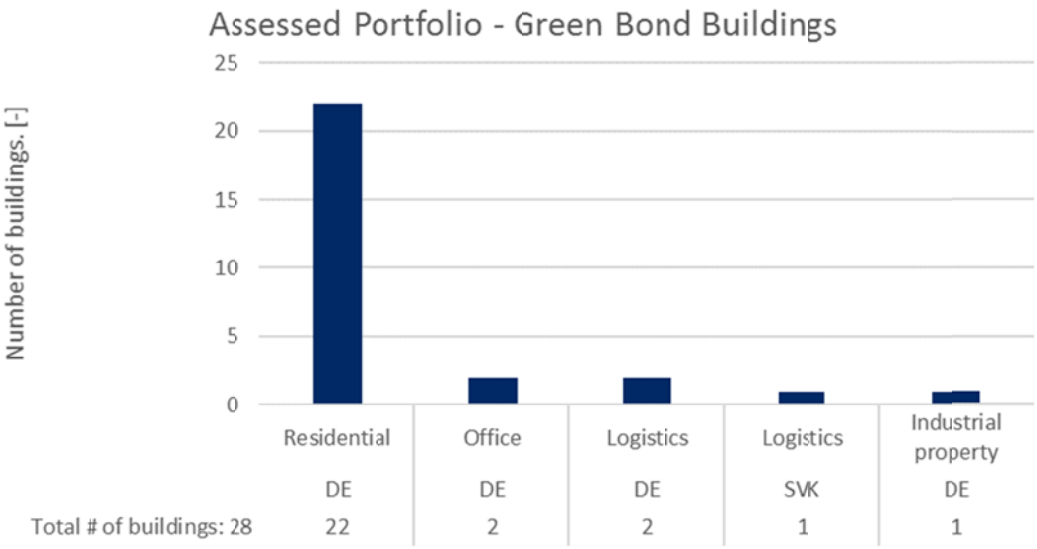

Figure 13: Portfolio overview

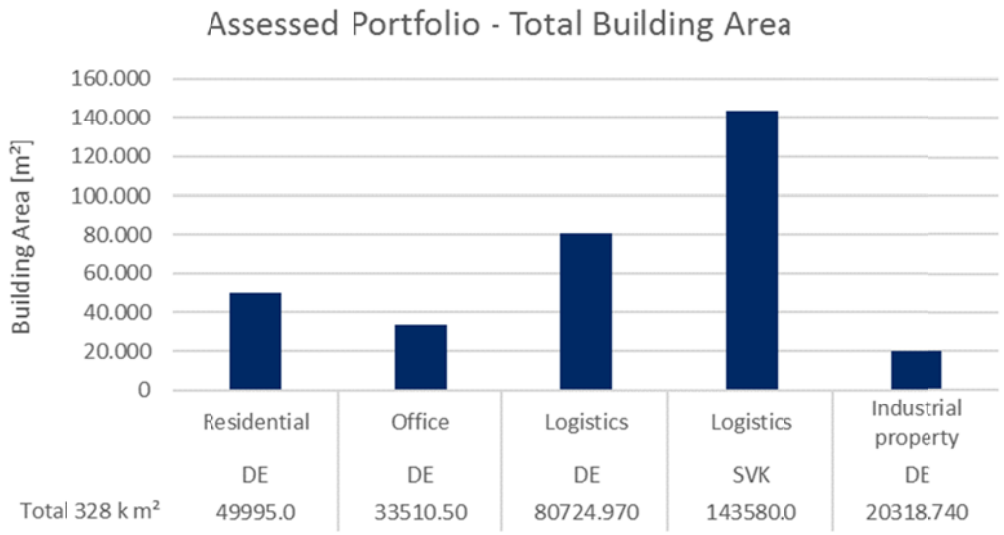

Figure 14: Portfolio overview

8.2 Building Selection

The following figure shows the total selected portfolio volume. Buildings that meet more than one criteria are accounted only once. There are several buildings that meet for example the energy efficiency class and the EnEV2009 standard. But they are only counted in the EnEV subpool.

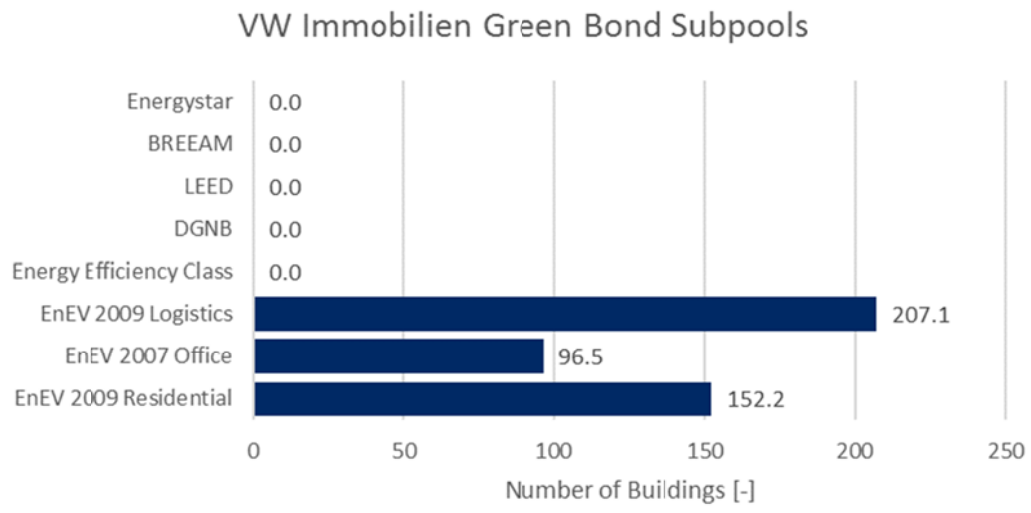

Figure 15: Selected buildings grouped in subpools.

9 Framework Summary

- **Green residential buildings** which meet the following regional, national and internationally recognized regulations, standards or certifications:

  (i) New or existing residential buildings belonging to top 15% low carbon buildings in Germany
    (i) EnEV 2009 regulation and later.
    (ii) Existing or refurbished residential buildings that meet energy efficiency classes "Energieeffizienzklasse" A+, A, B
    (iii) Renovated building exceeds the new building's energy target by a maximum of 40%

  (ii) New, existing or refurbished green commercial building which received at least following classifications:
    (i) Volkswagen Immobilien Blue Building and Blue Building Plus Standard[1]
    (ii) DGNB "Silver", NWO09 and later

- **Green commercial office buildings** which meet regional, national or internationally recognized regulations, standards or certifications in either:

  (i) New or existing office buildings belonging to top 15% low carbon buildings in Germany[2],
    (i) German office buildings with an Energy Performance Certificate under EnEV[3] 2007 regulation and later[4].
    or
    (ii) German office buildings from 1995 with a maximum site energy consumption of 120 kWh/m²/a (assumption based on research from German Energy Agency Dena). The German Energy Passport for commercial buildings [Energieausweis Nichtwohngebäude) is an example of an instrument that VOLKSWAGEN IMMOBILIEN will use to verify compliance.
    (iii) Renovated building exceeds the new building's energy target by a maximum of 40%

  (i) New, existing or refurbished green office buildings which received at least following classifications:
    (i) Blue Building and Blue Building Plus,

[1] Blue Building is an internal certification. Blue Building sets the requirements for thermal comfort, visual comfort, acoustic comfort, opportunity for individual tenants to control local environment, availability and design of outdoor space, and a link to nearby community facilities.

[2] The methodology is partly defined by Drees & Sommer Advanced Building Technologies GmbH as a green bond standard for commercial office and retail real estate in Germany

[3] EnEV – Energieeinsparverordnung (Ordinance on the Implementation of the Energy Saving Act EnEG). The buildings are calculated using a standardized calculation method in accordance with DIN V 18599.

[4] This is a very conservative approach since also German office buildings from 1995 are potentially part of the top 15% of the local market.

(ii) LEED “Gold “ NC or CS v3 and later,
(iii) DGNB “Silver”, NBV09 and later
(iv) BREEAM “Very Good”,
(v) ENERGY STAR “85“
(vi) or equivalent or higher level of certification; The certified buildings must also have a good energy performance.

– **Green commercial <u>production</u> and <u>logistics</u> buildings** which meet regional, national or internationally recognized regulations, standards or certifications in either:

(i) New or existing logistics/ production buildings belonging to top 15% low carbon buildings in Germany or Slovakia
(i) EnEV 2009 regulation and later.
(ii) Renovated building exceeds the new building's energy target by a maximum of 40%

(ii) New, existing or refurbished green logistics/ production buildings which received at least following classifications :
(i) Blue Building and Blue Building Plus
(ii) LEED “Gold “ NC or CS v3 and later,
(iii) DGNB “Silver” NIN09 and later ,
(iv) BREEAM “Very Good”,
(v) ENERGY STAR “85“
(vi) or equivalent or higher level of certification; The certified buildings must also have a good energy performance.

– Clean transportation
(i) Infrastructure for clean energy vehicles, such as EV charging points.

This report covers 22 pages (incl. Cover Sheet and Table of Contents, *without* attachments).

Stuttgart, 2018-03-22

Drees & Sommer Advanced Building Technologies GmbH

Johannes Hopf Jens Kühlbrey