

National plan for increasing the number of nearly zero- energy buildings in Sweden



National plan for increasing the number of nearly zero-energy buildings in Sweden

By: **Sven Schimschar, Michelle Bosquet, Nesen Surmeli, Andreas Hermelink**

Date: **15 May 2013**

Project number: **BUIDE13616**

© Ecofys 2013 by order of: European Commission

Table of contents

1	Starting point	4
2	Application of the definition of nearly zero-energy buildings	5
3	Intermediate targets for improving the energy performance of new buildings in order to ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings	7
4	Intermediate targets for improving the energy performance of new buildings in order to ensure that by 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings	9
5	Policies and measures for the promotion of all new buildings being nearly zero-energy buildings after 31 December 2020	10
6	Policies and measures for the promotion of all new buildings occupied and owned by public authorities being nearly zero-energy buildings after 31 December 2018	13
7	Policies and measures for the promotion of existing buildings undergoing major renovation being transformed to nearly zero-energy buildings	14
8	Additional Information	16
9	Possible improvements	17
	Annex- Definition of nZEB	18

1 Starting point

Please give a short overview of your national building stock. Describe the most important characteristics and emerging needs. Additionally, illustrate the chronological development of national requirements on the energy performance of buildings (for an example, see guidance document)

- An important issue that should be highlighted in this context is the on-going work that has been carried out in Sweden in order to recurrently review the minimum requirements made of the energy performance of buildings. This is summarised in Table 2.1, which shows how energy economy requirements for housing have changed in three steps.

Energy economy requirements for housing, 2006-2012

Year 2006

Electrically heated and non-electrically

Climatic Zone I 150 kWh/m²

Climatic Zone II 130 kWh/m²

Climatic Zone III 110 kWh/m²

Year 2009

Electrically heated buildings 95 kWh/m²

Climatic Zone I 95 kWh/m²

Climatic Zone II 75 kWh/m²

Climatic Zone III 55 kWh/m²

Year 2012

Non-electrically heated buildings 130 kWh/m²

Climatic Zone I 130 kWh/m²

Climatic Zone II 110 kWh/m²

Climatic Zone III 90 kWh/m²

- As the table above shows, energy economy requirements were tightened up in multiple stages between 2006 and 2012. As a first step, stricter energy economy requirements were introduced for electrically heated buildings in 2009. The requirement levels laid down at that time are still in force. The next review, BBR 19, which this year is being applied in parallel to the previous requirement levels prior to full implementation as of 2013, tightened up the requirements for non-electrically heated buildings compared with the levels that began to apply in 2006. It may also be worth noting that reviews of what requirements are made in respect of energy use in buildings were also carried out prior to 2006, but since the requirements took a different form at that time than they do now, it would be difficult to make a comparison that can be summarised in a table.
- The table and the reasoning above highlight an important principle that applies to how work on the energy economy requirements is carried out in Sweden. Regular reviews of the requirements take place, and thus far they have always resulted in stricter requirements.

In light of factors such as the tightening-up that took place between 2006 and 2012 and technical and economic development, as well as socio-environmental factors affecting the property market, the Government's view is that forthcoming reviews will also give rise to such step-by-step tightenings-up as are justified environmentally, socio-economically and from the point of view of real estate economics. A first audit point for this is scheduled for 2015. Part 2.3 goes into detail about a number of aspects associated with this audit point. The recurrent revisions of the energy requirements are an important part of Sweden's strategy for moving towards nearly zero-energy requirements and tightening up requirements for energy economy and the work on nearly zero-energy buildings on a step-by-step basis.

2 Application of the definition of nearly zero-energy buildings

Please indicate how a nearly zero-energy building is defined within national context and explain underlying assumptions and factors that provide the rationale for the chosen definition.

For reporting the detailed application in practice of the definition of nearly zero-energy buildings, the table presented in the Annex is to be used.

If a national definition of nearly zero-energy buildings does not exist yet in your country, please indicate here whether precise plans are already under development and if so, please describe these plans. Please also describe if any currently used non-governmental definitions will be considered in these plans and/or a future directive.

- A recast version of the EU's Energy Performance of Buildings Directive entered into force in the spring of 2010 (referred to below as the recast Directive). The Government submitted its Government Bill 2011/12:120, towards effective energy certification, to the parliament on 15 March 2012. In that Bill, the Government proposed how the recast Directive could be implemented in Sweden in relation to energy certification and certain related issues. The said Bill did not, however, deal with the provisions of the Directive on what are referred to as 'nearly zero-energy buildings'. Issues relating to how the term 'nearly zero-energy buildings' is to be applied in Sweden have been analysed in a number of stages. Reports commissioned by the Government from the Swedish Energy Agency and the Swedish National Board of Housing, Building and Planning in 2010 formed the basis of a memorandum that was produced in Sweden's Government Offices, largely during the course of 2011. In connection with the work on the memorandum, further analyses were carried out by both experts within the civil service and consultants.
- **The Government's view:** Given that the nearly zero-energy level will, from 2021, essentially be the legally binding level for energy economy requirements applied to all new buildings, a Swedish application of the term 'nearly zero-energy buildings' should include stricter requirements for energy economy in comparison with the requirements applying under current building regulations – in any case for most categories of buildings and climatic zones. There is not, at present, adequate information on which to base a quantified guideline for the extent of tightening-up that could be appropriate. Rather, this must be evaluated on a solid basis involving, amongst other things, an assessment of existing low-energy buildings, some demonstration projects for new energy-efficient buildings, economic analyses and so forth. Tightening-up must only take place when it is justified environmentally, socio-economically and from the point of view of real estate economics.
- In Sweden, reviews are carried out of the energy economy requirements, including in light of the requirements laid down in the EU's Energy Performance of Buildings Directive. These reviews have consistently led to stricter requirements. Thus, as an example, the requirements pertaining to non-electrically heated residences in Climatic Zone III have been tightened up from a maximum permissible energy use level of 110 kWh/m² in 2006 to 90 kWh/m² as of January 2013. In light of factors such as the tightening-up that took place between 2006 and 2012 and technical and economic development, as well as socio-environmental factors affecting the property market, the Government's view is that forthcoming reviews will also give rise to such step-by-step tightening-up as are justified environmentally, socio-economically and from the point of view of real estate economics. A first audit point for this is scheduled for 2015. These recurrent revisions are an important part of Sweden's strategy for moving towards nearly zero-energy requirements and tightening up requirements for energy economy and the work on nearly zero-energy buildings on a step-by-step basis.
- Primary energy aspects are taken into consideration to a degree under current Swedish building regulations. The energy economy requirements laid down in Swedish building regulations are laid down in such a way that account is given to primary energy use for certain kinds of energy. Thus, the level of requirements is differentiated between buildings heated using electricity and those which are not. This is illustrated in Table 2.2 below, which provides some examples of the maximum energy use per m² and year permissible under current Swedish building regulations. The example relates to residential buildings and the values specified for non-electrically heated buildings are the levels applicable under BBR 19, which will fully apply as of January 2013.
- Requirements for electrically heated and non-electrically heated buildings pursuant to current building regulations
 Climatic Zone I:
 Electrically heated houses 95 kWh/m² per year,
 Non-electrically heated houses 130 kWh/m² per year
 Climatic Zone II:

Electrically heated houses 75 kWh/m² per year,
Non-electrically heated houses 110 kWh/m² per year
Climatic Zone III:
Electrically heated houses 55 kWh/m² per year,
Non-electrically heated houses 90 kWh/m² per year

- As the table shows, Swedish building regulations in their current form lay down somewhat stricter requirements for energy economy in electrically heated buildings. This means that the Swedish building regulations, in their current form, also take account of the higher degree of efficiency in a primary energy context that it is possible to judge that, for example, district heating has, by means of the requirements pertaining to a specific end use are stricter for electrical heating than they are for, for example, district heating. As the examples above show, the maximum permitted levels for end use in non-electrically heated houses are roughly 1.4 times higher than those for electrically-heated houses in Climatic Zone I. Similarly, the maximum permitted levels for non-electrically heated houses in Climatic Zone II are roughly 1.5 times higher than those for electrically-heated houses in the same climatic zone. Finally, in Climatic Zone III, the maximum permitted levels for end use for non-electrically heated houses are roughly 1.6 times higher than those for electrically-heated houses in the same climatic zone.
- Electrically heated buildings also had a requirement on maximum permissible installed power.

• **The role of renewable energy in nearly zero-energy buildings**

The Government's view: The definition of nearly zero-energy buildings laid down in the Directive also includes wordings to the effect that the low amount of energy required should come, to a very significant extent, from energy from renewable sources. Sweden has a high proportion of renewable energy sources in its energy use, including energy use in buildings. Sweden applies general instruments to support the supply and use of energy from renewable sources, lays down requirements in its legislation on energy certification relating to the analysis of alternative energy supply systems and provides relatively advantageous conditions in the Swedish National Board of Housing, Building and Planning's building regulations for heating and air conditioning systems powered by energy from renewable sources. Sweden has implemented the EU Directive on the promotion of the use of energy from renewable sources, including those provisions relating to renewable energy in buildings. In light of this, Sweden can be regarded as satisfying the requirements laid down in respect of renewable energy in nearly zero-energy buildings.

3 Intermediate targets for improving the energy performance of new buildings in order to ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings

Please report the 2015 targets ensuring that by 31 December 2020 all new buildings are nearly zero-energy buildings. Also explain how they relate to and help to ensure that all new buildings are nearly zero-energy buildings by 31 December 2020.

What are the qualitative and quantitative 2015 targets for all new buildings?

3.1.1 Qualitative 2015 targets: Interim energy related requirements for new residential and non-residential buildings

Requirements on fraction of renewable energies: N/A

Requirements on useful energy demand: N/A

Requirements on primary energy demand: N/A

3.1.2 Quantitative 2015 targets: Share of nZEB according to official nZEB definition on all newly constructed buildings (define reference parameter e.g. number of buildings, floor area, volume etc.):

Miscellaneous:

From your point of view, how close is your country at the moment in achieving this target? In case there is no target defined yet, please indicate when it is expected to have such a target.

- **The Government's view:** There should be an audit point for Sweden's implementation of the Directive's requirements pertaining to nearly zero-energy buildings in 2015. The intention is that the following qualitative objectives will be satisfied by that year. By that time, an adequately large number of relevant schemes should have been put in place, followed up on and evaluated in such a way that the information basis covering the relationship between stricter energy economy requirements and other technical functional requirements, actual additional costs linked to energy-efficient construction and actual environmental benefits of energy-efficient construction has been improved considerably. The schemes should provide experiences that have a wider geographic spread across Sweden than is currently the case. Furthermore, schemes should have been realised that markedly increase the dissemination of knowledge about quality-assured, energy-efficient construction to relevant actors. Construction projects with the objective mentioned initiated in the construction and property sector should be encouraged in a clear way during the period, irrespective of who initiates them. The Government has commissioned the Swedish National Board of Housing, Building and Planning and the Swedish Energy Agency to undertake the analyses necessary for the audit by June 2015.
- **Reasons behind the Government's view:** The Directive states that Member States' national plans for increasing the number of nearly zero-energy buildings must contain intermediate targets for improving the energy performance of new buildings, by 2015, with a view to preparing the implementation of requirements for 2020 and 2018. The current information basis does not permit the setting of binding quantified target for 2015. This is the background to the Government's decision to word its views as more qualitative objectives that should be met. The Swedish Energy Agency's proposal for a strategy for low-energy buildings and its budgetary data for 2012 include proposals for demonstration projects and skill-enhancement schemes. No precise assessment is made in this communication of the suitable scope for schemes of this kind. As stated

above, this will be investigated further and further considerations presented in the 2013 Budget Bill. For 2015, the intention is that sufficient schemes will have been put in place to have significantly increased the information basis required in order to specify legally binding requirements for nearly zero-energy buildings and that experiences will also have been shared with relevant actors. Demonstration projects are very valuable, but self-initiated projects within affected sectors should also be encouraged, something that could take place, for example, within the networks in which the Swedish Energy Agency and the Swedish National Board of Housing, Building and Planning already participate. It is desirable for self-initiated projects of this kind to be based on the same target levels as those projects forming part of the promotional measures. The Government believes that building considerably more energy-efficient buildings would most likely result in significant environmental benefits and improved security of supply for energy. It is an important aim of systematically monitoring more energy-efficient buildings – alongside the issues of the impact on other technical functional requirements and potential additional costs – to shed more light on these aspects.

- the Government has reached the conclusion that the way Sweden's building regulations are framed means that they do take account of primary energy aspects and that, through them, there are opportunities to account for primary energy aspects in accordance with the requirement for a numerical indicator for primary energy laid down in the Directive (Article 9(3)(a)).

The instruments Sweden uses generally promote the use of renewable energy, irrespective of whether or not the use of the energy takes place in buildings. Of course, there is always the possibility of further developing or supplementing instruments in order to make them more effective. The opinions of the consulted bodies make the case for the potential for development in this way both in respect of investigating and taking account of primary energy aspects in a clearer way than at present and of taking account of renewable energy sources in a more consistent way. If an analysis were to highlight possibilities of improving the technological neutrality of the building regulations in a way that did not result in disadvantages elsewhere, changes of this kind, too, could be on the agenda. These types of question, too, should be analysed over the years leading up to the audit point in 2015.

4 Intermediate targets for improving the energy performance of new buildings in order to ensure that by 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings

Please report here the 2015 targets ensuring that by 31 December 2018 all new public buildings are nearly zero-energy buildings. Also explain how they relate to and help to achieve that by 31 December 2018, all new public buildings are nearly zero-energy buildings

What are the qualitative and quantitative 2015 targets for all new buildings occupied and owned by public authorities?

4.1.1 Qualitative 2015 targets: Interim energy related requirements for new public buildings

Requirements on fraction of renewable energies: N/A

Requirements on useful energy demand: N/A

Requirements on primary energy demand: N/A

4.1.2 Quantitative 2015 targets: Share of public nZEB according to official nZEB definition on all newly constructed public buildings (define reference parameter e.g. number of buildings, floor area, volume etc.):

N/A

Miscellaneous:

From your point of view, how close is your country at the moment in achieving this target? In case there is no target defined yet, please indicate when it is expected to have such a target.

5 Policies and measures for the promotion of all new buildings being nearly zero-energy buildings after 31 December 2020

5.1 Residential buildings	
5.1.1 Relevant regulations	<p>Swedish Board of Housing, Building and Planning's building regulations BBR 19 and further tightening to come next scheduled to December 2014</p> <p>Regulations into force 1st of January, 2021, will be the nearly zero level that is compulsory to fulfil.</p>
5.1.2 Relevant economic incentives and financing instruments	
5.1.3 Energy performance certificates' use and layout in relation to nZEB standard	Regulations on EPC of buildings, energy class/level A, is very high energy performance and is changing with the development of the building regulations
5.1.4 Supervision (energy advice and audits)	Control system for new buildings and energy declaration of buildings scheme
5.1.5 Information (tools)	Building declaration/certifications system and local and regional climate and energy advisors
5.1.6 Demonstration	New program for demonstration of low energy buildings will lead to NZEB at a well-defined level is recently launched by the Swedish Energy Agency in cooperation with the National board of Housing, Building and Planning.
5.1.7 Education and training	BUS Sweden
5.2 Non-residential buildings (same comments as for residential buildings)	
5.2.1 Relevant regulations	
5.2.2 Relevant economic incentives and financing instruments	
5.2.3 Energy performance certificates' use and layout in relation to nZEB standard	
5.2.4 Supervision (energy advice and audits)	
5.2.5 Information (tools)	
5.2.6 Demonstration	
5.2.7 Education and training	
5.3 From your point of view, how would you evaluate the current measures that are in force? Please also try to describe the existing gap between what is in force and what should be in force in order to ensure that after 31 December 2020, all new buildings are nearly zero-energy buildings. Are there precise measures planned for the future?	
<ul style="list-style-type: none"> The Government's view: Promotional measures should be put in place in order to facilitate the implementation of the requirements for nearly zero-energy buildings. The overall purpose of these promotional measures is two-fold, namely to help minimise potential additional costs for energy-efficient construction by reducing learning costs and to help ensure, through improved knowledge, that the final, legally binding definition of nearly zero-energy building is built on a solid basis. The promotional measures should include, amongst other things, demonstration projects with a larger geographical spread than has hitherto been the case for the construction of low-energy buildings in Sweden, skill-enhancement schemes for key 	

groups, continuous follow-up and assessment of both all the technical functional requirements and cost aspects associated with energy-efficient buildings. Target levels for demonstration projects that are to be realised should be for it to be possible to cover the energy demand of the building, by and large, with a maximum of 105 kWh/m², if the building is located in northern Sweden, and a minimum of 20 kWh/m². It should also be possible to realise demonstration projects with target levels between these limit values.

- **Reasons behind the Government's view:** The Swedish Energy Agency proposed 12 categories of promotional measures in its report A Strategy for Low-Energy Buildings. These included demonstration projects for new construction and renovation to nearly zero-energy level, scaling-up demonstration projects that have already been carried out to form major schemes, follow-up and information in order to share experiences from demonstration projects in order to achieve the large scale construction of nearly zero-energy buildings, long-term and on-going follow-up and cost-benefit analyses when building nearly zero-energy buildings and information and training schemes for actors.
- The Government takes the view that many of these proposals seem to be relevant, even if no definitive position can be taken in this communication about the scope of promotional measures or exactly how many and which measures are to be carried out. It is clear that it is justified to carry out certain demonstration projects in order to ensure relevant information, not least about the framework conditions in place for energy-efficient construction in those parts of Sweden where there has been little experience of this kind of construction hitherto.
- It is, moreover, quite clear that both the Swedish Energy Agency and the Swedish National Board of Housing, Building and Planning will need to play an active role in the implementation of the promotional measures. In order to ensure the basis required in order to draft building regulations, there is a need for expertise both in the energy field and in respect of buildings as systems, and all the technical functional requirements that they have to meet. The views expressed in its consultation submission by VINNOVA in respect of the importance of coordinating work with similar activities carried out within its work on challenge-driven innovation and with relevant activities that have benefited from the support of the Delegation for Sustainable Cities seem to us extremely relevant to ensuring a rational use, in the overall perspective, of limited resources.
- The Government otherwise takes the view that it is very much justified to exploit what knowledge is already out there and see what options there are for relevant evaluations of low-energy buildings that have already been built.
- The background to the target levels set out in the Government's view is that there is a need for relevant target levels for the demonstration projects in order to make it possible to produce a usable basis for the establishment of a legally binding application of nearly zero-energy requirements.
- The exact distribution of resources between different sub-projects should be left to the authorities to decide, with a certain degree of flexibility. The wordings in the Directive do provide some boundaries for prioritisation of this kind, however. It can thus be observed that the most stringent requirements for nearly zero-energy buildings in the Directive relate to new construction, which, in all likelihood, should be reflected in the prioritisation of promotional measures. Measures relating to the follow-up and evaluation of both actual energy use and other technical functional requirements and any additional costs involved in realising more energy-efficient buildings are important both for a number of political objectives – including, but not limited to, energy policy objectives – and for the socio-economic effectiveness of the implementation of the Directive.
- The Government also takes the view that analyses of innovation aspects and behaviour-related issues do have value, and that there should be an evaluation of the extent to which room can be found for these in the promotional measures.

No final conclusion has been reached in respect of how extensive measures should be. The Government will return to this issue in its 2013 Budget Bill and later in appropriation directions to the affected authorities. It is worth noting that some measures that promote nearly zero-energy buildings are already in place in the current budget year, one example being the skill-enhancement project Build up skills (BUSS). This has been accommodated within existing funds in expenditure area 21: Energy.



6 Policies and measures for the promotion of all new buildings occupied and owned by public authorities being nearly zero-energy buildings after 31 December 2018

6.1 All new buildings occupied and owned by public authorities	
6.1.1	Relevant regulations Similar comment as for other buildings except starting date, which will be, 1 st of January 2019
6.1.2	Relevant economic incentives and financing instruments
6.1.3	Energy performance certificates' use and layout in relation to nZEB standard
6.1.4	Supervision (energy advice and audits)
6.1.5	Information (tools)
6.1.6	Demonstration
6.1.7	Education and training
6.2	From your point of view, how would you evaluate the current measures that are in force? Please also describe the existing gap between what is in force and what should be in force in order to ensure that after 31 December 2018, all new public buildings are nearly zero-energy buildings. Are there precise measures planned for the future?
See section 5	

7 Policies and measures for the promotion of existing buildings undergoing major renovation being transformed to nearly zero-energy buildings

7.1 Residential buildings	
7.1.1 Relevant regulations	Swedish national Board of Housing Building and Planning regulation BBR 19 requirements for all alternation, related to the size, and the possibilities building
7.1.2 Relevant economic incentives and financing instruments	
7.1.3 Energy performance certificates' use and layout in relation to nZEB standard.	If an EPC is made after the renovation the level/ class A is a building with very high energy performance/nearly zero energy building
7.1.4 Supervision (energy advice and audits)	Control system in connection with the renovation requirements and control system in connection with the EPC system
7.1.5 Information (tools)	
7.1.6 Demonstration	
7.1.7 Education and training	Buss
7.2 Non-residential buildings See above same as for residential buildings	
7.2.1 Relevant regulations	
7.2.2 Relevant economic incentives and financing instruments	
7.2.3 Energy performance certificates' use and layout in relation to nZEB standard	
7.2.4 Supervision (energy advice and audits)	
7.2.5 Information (tools)	
7.2.6 Demonstration	
7.2.7 Education and training	
7.3 From your point of view, how would you evaluate the current measures that are in force? Please also try to describe the existing gap between what is in force and what should be in force in order to stimulate the transformation of buildings that are refurbished into nZEB. Are there precise measures planned for the future?	
<ul style="list-style-type: none"> Existing buildings The judgments reached in this communication mostly relate to the requirement under the Directive for new buildings to be nearly zero-energy buildings by 2021 (2018 for those new buildings owned and occupied by public authorities). The Directive also prescribes that, when existing buildings are renovated, Member States must promote their renovation to a nearly zero-energy building standard. Given how Swedish legislation in the field of planning and building is currently organised, an energy economy requirement for new buildings of nearly zero-energy level would indirectly mean that, even when an existing building is modified, it could become necessary to put measures in place to improve the characteristics of the building where this is reasonable given the conditions of the building. The requirement of nearly zero-energy level for new buildings thus also promotes the improvement of energy efficiency in existing buildings to nearly zero-energy level where reasonable. Where an 	

improvement of energy efficiency to this level is not reasonable, the Government's view is that the building in question should be brought up to the highest energy performance level that is reasonable. The legislation already provides flexibility in this regard.

- When altering a building, the requirements may be adapted and derogations from the requirements granted, consideration being given to the extent of the alteration, to the possibilities for the building and to provisions governing cultural sensitivity and the retention of character (Chapter 8 Section 7 of the Planning and Construction Act [2010:900]). The fact that the term 'conditions for the building' also incorporates an economic aspect is clear from the legislative drafting documents for the previous Planning and Construction Act (Government Bill 1985/86:1). It can also be seen from later legislative drafting statements that the legislators had no intention of making any changes in that regard (Government Bill 2009/10:170).
- Where renovation to nearly zero-energy level is possible and reasonable, with attention being paid to the conditions referred to above, this is still intended to happen. In addition to the indirect effect on the renovation of existing buildings that thus, in certain cases, results from an energy economy requirement of nearly zero-energy level for new buildings, renovation to nearly zero-energy level is also promoted by means of new construction to this level taking place on a larger scale. It is reasonable to assume that it contributes to knowledge if relevant applications of energy-efficient techniques become better known and disseminated, which in turn would be likely to reduce the additional costs for both new construction and renovation to more energy-efficient levels.
- The Government's view is that this level of ambition for existing buildings is in line with what is laid down in Article 9 of the Directive.

8 Additional Information

Please fill in any additional information on actions taken to increase the number of nearly zero-energy buildings in your country.

The Swedish National Board of Housing, Building and Planning's comments included the following. The proportion of renewables in the energy mix for buildings is already high, and major efforts to further increase this will only lead to marginal improvements, while the marginal cost can be expected to be high. Sweden has a target of having 50 % of end consumption of energy from renewable sources by 2020. In buildings, the proportion of renewable energy is around 62 %. This proportion is most dependent on the energy sources used for the production of heat and electricity, which are beyond the control of building owners. If all the electric heating in the form of direct electric heating and electricity in electric boilers were replaced by heat pumps with an annual heating factor of three and if all the fossil fuels in individually-owned combustion boilers were switched to district heating, it is calculated that the proportion of renewable energy for heating would only increase by 6 percentage points (to 68 %).

9 Possible improvements

Where do you see most room for improvement in order to increase the number of nearly zero-energy buildings in your country? Please also try to give examples for appropriate measures.

Annex- Definition of nZEB

1. General Information		
Country	Sweden	
Name of regulation ,directive, certification scheme	Energy efficiency is regulated by the planning and building act system, and the levels are revised at least every fifth year according to the EPBD, so far the revisions has been 2006/07, 2009/10, 2012/13, 2015 and will continue after the 2015 control point evaluating the low energy buildings and the demonstration projects it will lead to new regulations in due course to December 2018.	
Editor of regulation, directive, certification scheme	Normally the government gives the National Board of Housing, Building and Planning the task to investigate whether it is possible to sharpen the regulations and to manage the certification scheme.	
Year of introduction of current version	under development	
benchmark of current version (Select one)	<input type="radio"/> Energy Autonomous building <input type="radio"/> Efficient buildings <input type="radio"/> Net zero energy buildings <input type="radio"/> Plus energy buildings <input type="radio"/> Nearly zero energy buildings <input type="radio"/> Zero energy buildigns <input checked="" type="radio"/> Other	
Integration and consideration in national directive	Please add explanation/ comment/ source Click and choose.	
2. Field of Application		
2.1 Building category Select one and describe right is this typology included in the directive? Are special requirements or exceptions defined for this typology? If more than one definition exists, you can duplicate this appendix for each of them.		
<i>Member States shall ensure that all new buildings are nearly zero- energy buildings by 31 December 2020 respectively after 31 December 2018 (occupied and owned by public authorities). For the purpose of the calculation buildings should be adequately classified into the [...] categories. References: EPBD article 9.1a/b, EPBD Annex I.</i>		
Category <input type="radio"/> Residential <input type="radio"/> Non-residential <input type="radio"/> Residential and Non-residential	Please add explanation/ comment/ source	
single family houses	included in the directive	Just recently sent to the commission for 98/34 Consultation
apartment blocks	Click and choose.	Just recently sent to the commission for 98/34 Consultation
Offices	Click and choose.	Just recently sent to the commission for 98/34 Consultation
educational buildings	Click and choose.	Just recently sent to the commission for 98/34 Consultation
hospitals	Click and choose.	Just recently sent to the commission for 98/34 Consultation
hotels and restaurants	Click and choose.	Just recently sent to the commission for 98/34 Consultation
sports facilities	Click and choose.	Just recently sent to the commission for 98/34 Consultation
wholesale and retail trade service buildings	Click and choose.	Just recently sent to the commission for 98/34 Consultation
other types of energy-consuming buildings	Click and choose.	Just recently sent to the commission for 98/34 Consultation
2.2 New/retrofit buildings Select one and describe right. If more than one definition exists, you can duplicate this appendix for each of them.		

<p><i>New, and existing buildings that are subject to major renovation, should meet minimum energy performance requirements adapted to the local climate.</i></p> <p><i>Member States shall furthermore [...] stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings. Reference: EPBD preamble recital 15, EPBD article 9.2.</i></p>	
<input type="radio"/> New buildings <input type="radio"/> Retrofit <input type="radio"/> New and retrofit	<p>New and retrofit buildings is under the Building regulation from the National Board of Housing, Building and Planning.</p>
<p>2.3 Private/public buildings</p> <p>Select one and describe right. If more than one definition exists, you can duplicate this appendix for each of them.</p> <p><i>Member States shall ensure that by 31 December 2020, all new buildings are nearly zero- energy buildings and after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings. Reference: EPBD article 9.1a/b</i></p>	
<input type="radio"/> Private <input type="radio"/> Public <input type="radio"/> Public and private	<p>Please add explanation/ comment/ source</p>
<p>3. Energy Balance and calculation</p>	
<p>3.1 Balance Type</p> <p>Describe how renewable energy is calculated / included in the energy balance (e.g. renewable heat from solar thermal collectors reduces energy use for heat and DHW; renewable electricity reduces/compensates delivered electricity).</p> <p><i>[...] The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources</i></p> <p><i>Energy performance of a building means the calculated or measured amount of energy needed to meet the energy demand [...]. Reference: EPBD article 2.2, EPBD article 2.4</i></p>	
<input type="radio"/> energy demand vs energy generation <input type="radio"/> energy import vs energy export <input type="radio"/> virtual balance between demand and generation <input type="radio"/> not specified <input type="radio"/> other	<p>The measured amount of energy is the Energy performance of the building and the normal Swedish mix for energy is more than 60% renewable. Except from this the renewable energy such as solar energy in the building is not taken into consideration in the balance, Also free energy delivered from the ground/air to heat pumps is not included,</p>
<p>3.2 Physical boundary</p> <p>Select the widest possible boundary and describe right if/which further subdivisions are possible</p> <p><i>This directive lays down requirements as regards the common general framework for [...] buildings and building units. [...] building' means a roofed construction having walls, for which energy is used to condition the indoor climate. Reference: EPBD article 1.2, EPBD article 2.1</i></p>	
<input checked="" type="radio"/> single building <input type="radio"/> building unit <input type="radio"/> building unit <input type="radio"/> building site <input type="radio"/> cluster of buildings <input type="radio"/> quarter or city <input type="radio"/> other	<p>For the demands put on new buildings there is no subdivision but for renovated buildings the demands is on the renovated part. So if only the windows are changed there is a demand the U-value for the the window solely.</p>
<p>3.3 System boundary demand / energy uses included</p> <p>Define if this load sector is included in the energy balance calculation (other requirements like maximum consumption</p>	

values can be described below under item 5, further requirements).		
[...] energy performance of a building means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, inter alia, energy used for heating, cooling, ventilation, hot water and lighting. Reference: EPBD article 2.4		
space heating, domestic hot water	considered	Please add explanation/ comment/ source
ventilation, cooling, air conditioning	considered	Please add explanation/ comment/ source
auxiliary energy	Click and choose.	Please add explanation/ comment/ source
lighting	considered	Please add explanation/ comment/ source
plug loads, appliances, IT	Click and choose.	Please add explanation/ comment/ source
central services	Click and choose.	Please add explanation/ comment/ source
electric vehicles	Click and choose.	Please add explanation/ comment/ source
embodied energy	considered	Please add explanation/ comment/ source
3.4 System boundary generation / renewable energy sources included Select and explain right (e.g. only in building's physical footprint, on-site, on-site incl. import of off-site renewables like pellets, wood chips, rape oil etc.). How is CHP (based on non-renewable energy carriers like natural gas or oil) included?		
[...] The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby. [...] energy from renewable sources means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. [...] minimum levels of energy from renewable sources [...] to be fulfilled, inter alia, through district heating and cooling [...]. Reference: EPBD article 2.2, EPBD article 2.6, EPBD article 13.4		
generation on-site	not considered	Solar energy on site not included in the energy performance
generation near by	not considered	Free energy to heat pumps nearby not included in the energy performance
generation external	considered	Renewable energy in the Swedish mix considered as renewable
crediting	not considered	Please add explanation/ comment/ source
3.5 Balance period / calculation step What is the defined period of time over which the balance is calculated? Is the calculation period divided into calculation steps (e.g. one hour, one month or one heating and/or cooling season)?		
[...] The methodology for calculating energy performance should be based not only on the season in which heating is required, but should cover the annual energy performance of a building [...]. Reference: EPBD preamble recital 9 [...] requirements should be set with a view to [...] the cost-optimal balance between the investments involved and the energy costs saved throughout the lifecycle of the building [...] Reference: EPBD preamble recital 10.		
<input type="radio"/> Life cycle balance <input checked="" type="radio"/> Yearly <input type="radio"/> Seasonal <input type="radio"/> Other	Sweden is using measured value for annual consumption adapted to normal year	
3.6 Monthly accounting limitation Is a monthly accounting limit defined? Is it based on end energy (e.g. monthly electricity generation compensates monthly electricity loads) or on primary energy (any monthly generation compensates any loads)? Are surpluses transferred to an annual balance?		
<input type="radio"/> monthly source based end energy crediting <input type="radio"/> monthly primary energy crediting <input type="radio"/> nothing defined <input type="radio"/> other	Please add explanation/ comment/ source	
4. Accounting system		
4.1 Normalization		

<p>[...] including a numerical indicator of primary energy use expressed in kWh/m² per year. Reference: EPBD article 9.3a</p>	
<p> <input type="radio"/> person <input type="radio"/> gross floor area <input type="radio"/> net floor area <input type="radio"/> gross volume <input type="radio"/> net volume <input type="radio"/> usable floor area <input type="radio"/> treated floor area <input checked="" type="radio"/> conditioned area <input type="radio"/> other </p>	<p>IN Sweden we use different demands for electrical heated respectively not electrically heated buildings the factor in the latest suggested energy demand will be 1.6 for all over the country; note this factor is not the direct balance between use of electricity or not electricity but within the not electrical heated buildings the fan, pump ventilation and other restate energy can be electricity,so the factor is in fact higher than 1.6 between electrical energy and other energy. This is recently sent to the commission for 98/34 consultation. Area supposed to be conditioned to 10 centigrade.</p> <p>Sweden also expect fossil fuel to be phased out from the building energy system to 2020 as an old environmental target.</p>
<p>4.2 Primary metric</p> <p>Indicate which metric is used for the energy performance calculation / energy balance and give input on (the source of) the conversion factors on the right. Possible sources are e.g. EN 15603 or national and regional codes.</p>	
<p><i>The energy performance of a building shall be expressed in a transparent manner and shall include an energy performance indicator and a numeric indicator of primary energy use, based on primary energy factors per energy carrier, which may be based on national or regional annual weighted averages or a specific value for on- site production. Reference: EPBD Annex 1.</i></p> <p>[...] including a numerical indicator of primary energy use expressed in kWh/m² per year. Reference: EPBD 9.3a</p> <p>[...] primary energy' means energy from renewable and non- renewable sources which has not undergone any conversion or transformation process. Reference : EPBD article 2.5</p>	
<p> <input type="radio"/> energy need <input checked="" type="radio"/> energy use <input type="radio"/> delivered/site energy <input type="radio"/> primary / source energy (renewable part included) <input type="radio"/> primary / source energy (renewable part not included) <input type="radio"/> (equivalent) carbon emissions <input type="radio"/> exergy <input type="radio"/> energy costs <input type="radio"/> environmental credits <input type="radio"/> points (labeling system) <input type="radio"/> other </p>	<p>Please add explanation/ comment/ source</p>
<p>4.3 Secondary metric</p>	
<p> <input type="radio"/> energy use <input type="radio"/> energy need <input type="radio"/> delivered/site energy </p>	<p>Please add explanation/ comment/ source</p>

<input type="radio"/> primary / source energy (renewable part included) <input type="radio"/> primary / source energy (renewable part not included) <input type="radio"/> (equivalent) carbon emissions <input type="radio"/> exergy <input type="radio"/> energy costs <input type="radio"/> environmental credits <input type="radio"/> points (labeling system) <input type="radio"/> other	
4.4 Symmetric or asymmetric weighting	
<input type="radio"/> symmetrical weighting <input type="radio"/> asymmetrical weighting	Please add explanation/ comment/ source
4.5 Time dependent weighting	
Static: no time dependent weighting (annual constant weighting/factors) Quasi-static: seasonal/monthly average weighting factors Dynamic: weighting factors based on shorter time periods /hourly basis (according to energy offer and demand in the grid)	
<i>Primary energy factors [...] may be based on national or regional yearly average values and may take into account [...] European standards. Reference: EPBD 9.3a</i>	
<input type="radio"/> static conversion factors <input type="radio"/> quasi static conversion factors <input checked="" type="radio"/> dynamic conversion factors	Based on comparison with a normal year. Based on the actual temperatures measured during the measurement year compared to the normal yearly temperature.
5. Further requirements	
5.1 Fraction of renewables	
Select and describe right if guidelines are given for any fraction of renewable energy and indicate how/at which level a certain fraction is calculated (e.g. solar thermal heat might be a fraction of energy use, electricity from PV a fraction of delivered energy.)	
<i>Member States shall introduce [...] appropriate measures [...] to increase the share of all kinds of energy from renewable sources in the building sector [...]. By 31 December 2014, Member States shall [...] require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings [...] Reference: RED article 13.4</i> <i>[...] The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources [...] Reference : EPBD article 2.2</i>	
<input type="radio"/> defined <input type="radio"/> not defined <input type="radio"/> defined in other regulation	Should be and we consider the Swedish energy mix good enough.
5.2 Temporal performance	
Describe if any requirements are given for a temporal match between on-site energy load and on-site energy generation (load match) and which calculation procedures are applied.	
Load match	Not applicable

<input type="radio"/> defined <input type="radio"/> not defined	
Grid interaction <input type="radio"/> defined <input type="radio"/> not defined	Not applicable Please add explanation/ comment/ source
5.3 Energy performance or rating requirements Are limitations given for a standard energy rating, an energy indicator or maximum demands for heating, cooling, embodied energy, demand of appliances, etc.? If yes, type the values and give explanations on the right <i>nearly zero-energy building means a building that has a very high energy performance [...]. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources [...]</i> <i>The energy performance [...] shall [...] include an energy performance indicator and a numeric indicator of primary energy use [...]. Reference : EPBD article 2.2, EPBD Annex 1.</i>	
Performance or rating <input type="radio"/> defined <input type="radio"/> not defined <input checked="" type="radio"/> defined in other regulation	Energy performance factor defined in the legislation for the EPCs Primary factor defined in the difference between the regulation for electrical heated energy and non electrical heating within the legislation
Energy Performance indicator Is an energy performance indicator defined? If yes, type the values and the according unit.	Within the legislation for the EPC the energy performance is given by a scale based on partly the building regulations and partly statistics from the EPC register so the three highest energy performance levels A, B and C are 50%, 75% and 100% of the regulated value and the rest of the levels are defined so the division in two halves of the buildings is in the middle of level E.
Numeric indicator of primary energy use Is a numeric indicator of primary energy use defined? If yes, type the values and the according unit.	There are two different demands, for electrically heated and not electrically heated buildings. The factor between these is 1.6 in the latest suggested revision. Though this includes the electricity measured for electrical energy used for fans, pumps and so on in the not electrical heated buildings so the factor is in fact a little higher. And as we are not keen on having electricity used for cooling there is a factor of three for heating used for cooling.
5.4 General framework / prescriptive requirements Describe which guidelines are given for: Thermal characteristics (insulation, thermal bridges, thermal capacity, passive heating, internal loads, solar protection) Efficiency of installations (hot water supply, air-conditioning, lighting fan power) <i>The methodology shall [...] take into consideration: thermal characteristics (thermal capacity, insulation, passive heating, cooling elements, and thermal bridges), heating installation and hot water supply, air-conditioning installations, natural and mechanical ventilation, built-in lighting, the design, positioning and orientation of the building, outdoor climate, passive solar systems and solar protection, [...], internal loads. Reference: EPBD Annex 1</i>	
<input checked="" type="radio"/> defined <input type="radio"/> not defined <input type="radio"/> defined in other regulation	As we use measure values all this is included in the measurements.
5.5 Definition of comfort level & IAQ requirements (for winter and summer season, beside other national directives)	

Describe which guidelines are given for indoor climatic conditions, minimum or maximum indoor temperature, minimum lighting levels/ daylight availability, minimum ventilation rates/ natural ventilation, indoor air quality, max. CO2 levels, etc.	
<p><i>This Directive [...] takes into account [...] indoor climate requirements [...] Reference: EPBD article 1.1</i></p> <p><i>The methodology shall [...] take into consideration: [...] indoor climatic conditions [...] Reference: EPBD Annex 1</i></p> <p><i>That includes [...] indoor air-quality, adequate natural light [...].Reference:</i></p> <p><i>EPBD preamble recital 9</i></p>	
<input checked="" type="radio"/> defined <input type="radio"/> not defined <input type="radio"/> defined in other regulation	<p>The building regulations tell what the building shall be able to fulfil when it comes to comfort and ventilation and the Public health agency regulates which temperature a building shall have.</p>
<p>5.6 Monitoring procedure</p> <p>Describe if and how a monitoring mandatory is formulated; calculated or measured values are used; an evaluation of the indoor environmental quality is considered; which calculation step is used.</p>	
<p><i>[...] energy performance of a building means the calculated or measured amount of energy needed [...] Reference: EPBD article 2.4</i></p> <p><i>Member States shall encourage the introduction of intelligent metering systems [...] and the installation of automation, control and monitoring systems [...]. Reference: EPBD article 8.2</i></p>	
<input checked="" type="radio"/> defined <input type="radio"/> not defined	<p>Please add explanation/ comment/ source</p>

ECOFYS



sustainable energy for everyone



sustainable energy for everyone



ECOFYS Germany GmbH

Am Wassermann 36
50829 Köln

T: +49 (0) 221 27070-100

F: +49 (0) 221 27070-011

E: info@ecofys.com

I: www.ecofys.com