Working document

Explanatory Memorandum to the Working Document on a draft COMMISSION DELEGATED REGULATION (EU) No …/… implementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of windows for buildings

1. CONTEXT OF THE PROPOSAL

1.1. Grounds for and objectives of the proposal

Windows in buildings let in light and air, allow views to the outside, and at the same time help maintain indoor conditions by creating a barrier to outdoor conditions. Unique for windows as building envelope component is that apart from letting energy out they can also let energy in. Letting energy out (thermal losses) contributes to energy consumption for heating and is determined by the thermal transmittance of the window (together with air leakage). Letting energy in (solar heat gain) however helps to reduce energy consumption for heating and is determined by the (effective) solar factor of the window. Too much solar heat gain however may cause overheating during summer and possible use of air conditioning appliances that require energy to run.

According to the preparatory study (see Task 7 paragraph 5.2.2, 5.2.3 & 5.2.4) the energy consumption (by both space heating and cooling systems) associated to the use of windows is some 358 TWh/yr for residential façade windows, 99 TWh/yr for non-residential façade windows and 42 TWh/yr for roof windows in the year 2020.

Following the above, the energy performance of windows cannot be assessed solely on the basis of thermal transmittance as is the case for most other building envelope components. It needs to take into account at minimum both the solar energy heat gains (g value) and its thermal transmittance, and preferably air leakage and frame fraction as well.

The main market for windows is the residential façade window replacement market as some 68-72% of windows sold (year 2000-2050) are for replacement. This market segment in particular is in many cases not regulated as strict as (building components for) new buildings and large renovations, for which Member States have to set requirements at cost optimal level in accordance with the EPBD. And even if MS have implemented minimum requirements for replacement windows, then often the requirements specify only a minimal thermal transmittance, ignoring possible solar heat gains.

Consumers interested in replacing their old windows are depending on suppliers of windows on information regarding the performance of the products. Currently this information, if present, does not contain an integrated assessment of all relevant window characteristics into an easy understandable energy performance value or rating. The rules set by Regulation 305/2011[1] (Construction Products Regulation or CPR) only specify that where a window characteristic is required the value is established using harmonised standards. This information, if present, is expressed in a way that is difficult to interpret by laypersons.

At the same time, improvement of energy efficiency of buildings is regarded as one of the most urgent actions to reduce dependency on fossil fuels, reduce carbon emissions and

[1] OJ L 88, 4.4.2011, p. 5.

improve security of supply of fuels. According to the preparatory study windows in the EU in general are responsible for 24% of the EU heating demand and 9% of the cooling demand (values relate to year 2010) and improvement of the performance of windows could significantly contribute to the above goals.

The problems that the EU faces in improving the existing stock of windows are the following:

- the current legislation in place (CPR, EPBD) does not address the specific market of small scale window replacement to its full extent. The information on window characteristics supplied with the window according to the rules set by the CPR is, if even present, not easy to interpret by laypersons such as the average consumer. The EPBD prescribes setting of requirements at cost optimal level, but the implementation is not always consistent.
- there is a risk of proliferation of private window labelling schemes active at national level. This proliferation could fragment the European internal market.

The preparatory study discusses the main policy options for addressing the problems outlined above and concludes the following regarding policy options other than energy labelling:

- The **business-as-usual** option (existing policies continue to apply, no new EU measures specifically for windows) will likely result in a proliferation of window energy label schemes, all different to each other. It can be expected that especially voluntary private schemes will proliferate (there are already over 12 schemes in operation in 11 MS). Voluntary private schemes are beyond full government control as they are privately owned/operated and participation is voluntary, which means that supplying fair and meaningful information cannot be enforced by public authorities and will depend on market forces solely. Such schemes can require testing of window characteristics using national standards or methods different to European harmonised product standard hEN 14351-1, which means that window suppliers can be faced with increased administrative burden if participation to such schemes is sought, especially when they operate cross-borders[2]. In addition, it may be that MS governments will then consider introducing mandatory window labelling schemes themselves. The proliferation of various window labelling schemes is against the objectives of the internal market.
- **Self-regulation** (voluntary agreements) are not supported by the industries involved and are therefore not a realistic option.
- The setting of (specific or generic) **ecodesign requirements** is not advocated, as a complicated overlap with existing policies may result.

  Regarding specific ecodesign requirements, most Member States have, in accordance with the EPBD, implemented minimum efficiency requirements for building elements that form part of the building envelope (2010/31/EU, Article 7, paragraph 3) such as windows. A certain share of MS also has requirements for windows for existing buildings (replacement, retrofit) albeit at a lower level of stringency in many cases. Introduction of specific ecodesign requirements could thus overlap with minimum

[2] For example: A certain label scheme includes solar gains via opaque elements in the determination of the g-value of the window which is not in line with hEN 14351-1. Another label scheme requires determination of the air leakage rate not in line with hEN 14351-1. A third label scheme requires additional determination of the thermal characteristics as values determined for the European CE label cannot be used, and only allows calculated U_W values and not U_W values determined by tests.

efficiency requirements for building elements that form part of the building envelope that are regulated at national level and such an overlap should be avoided.

In case generic ecodesign requirements regarding basic window characteristics such as the U value, g value, etc. would be set, these could overlap with CE marking introduced under the Construction Products Regulation 305/2011 As both Ecodesign and CPR require require conformity assessment, such requirements under ecodesign could introduce a regulatory overlap or cause confusion in case a member State doesn't require certain characteristics to be stated whereas a possible ecodesign Regulation would require this. Information on basic window characteristics is simpler dealt with measures under the Energy Labelling Directive as this does not involve conformity assessment.

Generic ecodesign requirements related to non-energy aspects are not expected to alleviate the main problem related to resource efficiency of windows which is related to how the construction sector handles and treats construction and demolition waste, and not primarily related to the design of the window itself.

Energy labelling of windows however, is considered to be a realistic policy option that avoids the problems associated with the business-as-usual option or other options:

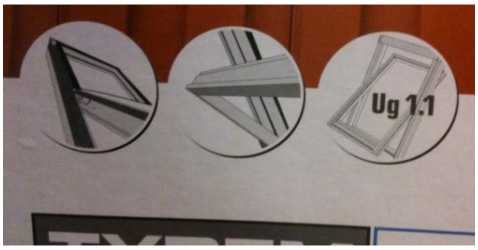
- EU labelling would help to avoid the expected proliferation of window energy labelling schemes. It would also avoid a possible development of different mandatory national labels interfering with the goal of one common market.
- The EU energy label for windows (as described in this proposal) will be based on window performance rating according the principles of the energy balance defined in international standards. The inputs for the calculation of energy performance would be aligned with applicable harmonised standards, so that administrative burdens are generally not increased.
- The mandatory nature of the EU energy label will ensure that all products in scope will carry the label, thereby fostering consumer awareness and opening possibilities for consumers to identify and select windows that offer improved energy performance (go beyond the minimum required performance).
- The EU energy label for windows would also help suppliers in explaining the benefits of the windows options offered by the supplier, and engage in a more meaningful discussion with the consumers. The technical fiche offers additional information that can help to make a more site specific quote.
- An EU Energy Label would not interfere with the objectives and procedures set out by the CPR. On the contrary, both schemes can be seen as supporting each other (the CPR setting the rules for provision of performance data, the energy label conveying this data to consumers in a more meaningful way).
- Neither would an EU energy label for windows interfere with the EPBD as setting minimum requirements on building elements remains the prerogative of Member States. The methodology for expressing the energy performance of windows (energy balance) introduced by the EU energy label for windows could be adopted by Member

States for setting more meaningful minimum requirements than using thermal transmittance values only, as already required under the EPBD[3].

The added value of a window energy label compared to information possibly presented under CE marking is that labelling allows a relative comparison. Where consumers are confronted with CE information only, this requires thorough understanding of U_W values (thermal transmittance), g values (total solar energy transmittance), and the class of the air leakage in order to discern the better performing window. It is generally believed, also by many stakeholders that have contributed to the preparatory study, that residential home-owners looking for replacement windows do not possess the knowledge to do so. A simple A-G rating of overall window performance would alleviate this gap in knowledge.

Secondly, CE marking information is only required in case the country of destination requires this information to be presented. Although in practice many suppliers avoid potential discussion and equip their windows with CE marking that shows the main performance characteristics, there are still windows sold that carry no or only limited information or information not in agreement with the harmonised standard (e.g. where the thermal transmittance U_g of the glazing unit, is shown and not the U_W of the complete window – as shown in the figure below).

Figure 1 Picture of (roof) window found in 'Do-it-yourself' store, showing only the U_g value (applies to glazing only, not the complete window)



This means that a certain (currently unknown) share of windows is not carrying a CE marking that shows the main characteristics.

The aim of this regulation is to introduce a harmonised scheme for labelling of windows (for buildings) according to their energy performance and providing standard product information for consumers. The labelling requirements also provide a dynamic incentive for manufacturers to improve energy performance and to accelerate the market take-up of windows with higher energy performance.

The proposal would complement the existing (recast of) the Energy Performance of Buildings Directive and the Construction Products Regulation.

1.2. General context

Consumers are largely unaware of the improvements that modern windows may offer in terms of energy and comfort. And there is indication that window suppliers (dealers, installers) are often also not capable of explaining the added value of a window performance based on an energy balance.

[3] See Annex I of Directive 2010/31/EU which mentions consideration of building or site characteristics etc. (3f), solar protection (3g) and solar exposure conditions (4a).

Complicating this matter is that windows are not solely specified on the basis of energy aspects only, as sound insulation, burglary resistance, privacy, resistance to fire or aesthetics play a role in the purchasing process as well. Consumers will have to weigh each aspect carefully when deciding for certain windows.

Other barriers that hamper the application of better performing windows are split incentives whereby another party than the one bearing the costs for energy is responsible for investments in the building envelope (the landlord or property owner), high upfront costs and disturbance of private space, or technical difficulties related to installing better performing windows (enough space for installation, effects on ventilation as the air leakage by the window may be reduced, preservation of historic quality of buildings, etc.).

The preparatory study also identified regulatory barriers to the uptake of windows with better performance. The main barrier is the lack of agreed boundary conditions (reference buildings and characteristics, climatic data, ventilation rates, etc.) to calculate the energy performance of windows based on an energy balance. Traditionally the energy performance of windows is expressed on the basis of the thermal transmittance (U value) only, as is the case for other building envelope components (walls, roofs, ground floors). Most Member States still have requirements applicable to windows based on thermal transmittance only.

The CPR requires that, in case the performance of a window is expressed, this performance is established using appropriate harmonised standards. These standards do not describe how to establish the performance of a window on the basis of an energy balance.

In some 10-11 European countries energy labelling schemes of windows have been implemented by either private, commercial parties or research institutes. The success of these schemes could not be fully assessed as information was not provided to the preparatory study authors and in many cases, changes in the market may also have been occurred through new legislation coming into force. Participation in such schemes is voluntary, although in the case of the UK participation is one way to show compliance with the requirement set in the national building codes[4]. Although most schemes are based on calculation of energy balance, all calculations are using different definitions of performance, parameters or equations leading to a fragmented European market for windows suppliers.

This proposal aims to address the barriers related to product information by introducing EU energy labels for windows based on an energy balance approach. It introduces the widely known A-G scale to cover the various types of windows, also taking into consideration the effect of different climate conditions on their performance.

In case the introduction of the label results in the market transformation as described in the preparatory study (Task 7 – tables 93, 94, 96, 97, 99 and 100), the savings in 2030 are estimated to be some 27 to 52 TWh/yr for residential façade windows (98 to 186 PJ_prim/yr), some 4 to 7 TWh/yr for the non-residential façade windows (13 to 27 PJ_prim/yr), and some 0.5 to 0.6 TWh/yr (1.8 to 2.3 PJ_prim/yr) for roof windows.

The savings in 2050 are estimated to be some 35 to 68 TWh/yr for residential façade windows (126 to 244 PJ_prim/yr), some 4 to 10 TWh/yr for the non-residential façade windows (15 to

[4] In this document the term 'Building Codes' refers to the rules that Member States have established for calculating and expressing the energy efficiency aspects of buildings, including the minimum performance values that may apply.

34 PJ_prim/yr) and some 1.8 to 2.4 TWh/yr (6.5 to 8.6 PJ_prim/yr) for roof windows (all according scenario A respectively scenario B, compared to business-as-usual)[5].

1.3. Existing provisions in the area of the proposal

In addition to a proposed implementing measure introducing energy labelling for windows, the following measures also address the environmental performance of these products:

– Directive 2010/31/EU2 of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings;

– Regulation (EU) No 305/2011 of the European parliament and of the council of 9 March 2011laying down harmonised conditions for the marketing of construction products

On national level there are already some 11-12 window labelling schemes active, initiated by private parties or research institutes. The majority of these labelling schemes apply an energy balance approach, expressing the performance of the window based on the thermal transmittance, solar heat gain and possibly also the air leakage and frame fraction.

1.4. Consistency with the other EU policies and objectives

Increased market take-up of better performing windows will contribute to the 20 % energy savings which should be achieved until 2020 according to the Energy Efficiency Action Plan [6], and are confirmed in the Commission’s Communication on Energy 2020[7] and Energy Efficiency Plan 2011[8]. The Energy Efficiency Plan 2011 lists recent and imminent mandatory measures, such as the (recasts of) Directives for ecodesign of energy-related products[9], energy labelling[10], energy performance of buildings (EPBD)[11] and energy efficiency (EED)[12]

More recently the European Union has identified the following goals, set out in the Energy Union Communication[13] as follows:

- a 40% cut in greenhouse gas emissions compared to 1990 levels;
- at least a 27% share of renewable energy consumption;
- at least 27% energy savings compared with the business-as-usual scenario.

The present proposal will complement promotion of the market take-up of efficient products, which is at the heart of the EU’s Europe 2020 strategy for smart, sustainable and inclusive growth[14], as it will improve energy efficiency, support the transition to a resource-efficient economy, encourage investment in R&D and ensure a level playing field for window products.

5 The savings indicated are based on tables 93, 94, 96, 97, 99 and 100 of the Lot 32 preparatory study Task 7 consolidated. The underlying data for residential façade windows is more robust than for non-residential windows and roof windows, for which major assumptions had to be introduced in the calculations. The savings identified for the non-residential sector and roof window sector should be treated with appropriate caution.

6 COM(2011)109 final

7 COM(2010) 639

8 COM(2011) 109

9 OJ L 285, 31.10.2009, p. 10–35

10 OJ L 153, 18.6.2010, p. 1–12

11 OJ L 153, 18.6.2010, p. 13-35.

12 OJ L 315, 14.11.2012, p. 1-56.

13 COM(2015)080

14 COM(2010) 2020

2. CONSULTATIONS PRIOR TO THE ADOPTION OF THE ACT

2.1. Consultation of interested parties

EU and international stakeholders and Member State experts were consulted from the very beginning of the preparatory study. In the course of the preparatory study meeting two public stakeholder meetings have been organised, on 17 March 2014 and 31 October 2014. Written comments from various stakeholders have been received before and after each stakeholder meeting and also after publication of draft reports on 24 February 2015.

[to add: consultations in context of Commission Working Documents, i.e. CF meeting etc.]

Summary of responses and how they have been taken into account

Based on comments received on the draft final reports published in 24 february 2015, an EU energy labelling scheme for windows is supported by a small number of major, international, industrial associations. Other national and multinational associations have expressed objections to an EU energy label for windows. The positions of Member States are largely unknown as only a few have responded to draft documents and their comments allowed room for interpretation.

Consumer NGO's are in favour of EU energy labelling of windows, albeit without consideration of adaptive elements and requiring consumer research to identify the most effective label (design and content).

Environmental NGO's are also in favour of EU energy labelling of windows but would like to see better designed pictograms or symbols, and the performance to be based on actual window size, rather than standard dimensions.

Product scope

Most stakeholders that have presented comments agree that the main focus of an EU label should be the residential replacement sector, as the non-residential and also new buildings sectors in general require involvement of specialists (building energy performance experts). Environmental NGO's disagreed and recommended to include non-residential windows.

Most stakeholders agreed that the product scope should be aligned with the scope of the harmonised standard hEN 14351-1 that applies to windows.

Product performance assessment

The glazing industry fears that establishing the energy performance of a window with adaptive elements properly activated is not realistic and could lead to consumers selecting windows that require extensive use of adaptive elements (e.g. shading devices). The solar shading industry argues that using shading devices allows windows to better respond to changing conditions (let heat in during heating season and block heat in cooling season). The proposals described in this Working Document allow a discussion on either approach.

Product label

A certain number of stakeholders are not against energy labelling of windows as such, but prefer this to be organised at national level (as is currently the case).

Energy labelling scales

[to be completed after CF meeting]

Timetable

[to be completed after CF meeting]

Testing and calculation methods

[to be completed after CF meeting]

2.2. Collection and use of expertise

Input from scientific expertise

External expertise was gathered through the preparatory study providing a technical, environmental and economic analysis, carried out by an external consultant on behalf of DG ENER.

Methodology used

The methodology of the study followed the provisions of the Directive 2010/30/EU, in particular its Article 10.3 thereof. The technical, environmental and economic analysis followed the structure of the 'Methodology for the Ecodesign of Energy-related Products' developed for the Commission's Directorate General for Enterprise and Industry and endorsed by stakeholders.

Main organisations/experts consulted

The preparatory study was conducted in an open process, taking into account input (where available) from relevant stakeholders including manufacturers, environmental NGOs, consumer organisations, EU/EEA Member State experts and experts from third countries.

Summary of advice received and used

[to be completed after CF meeting]

2.3. Impact assessment

[to be completed after CF meeting]

3. LEGAL ELEMENTS OF THE PROPOSAL

3.1. Summary of the proposed action

The proposed measure sets out new mandatory labelling and standard product information requirements for suppliers placing on the market and/or putting into service windows for buildings. This Working Document proposes alternative approaches for several aspects of energy labelling of windows.

These alternative approaches apply to the following aspects:

1) Scope, where alternatives relate to the inclusion or exclusion from scope of roof windows;

2) Expressing the energy performance of windows, where alternatives relate to:

   a) expressing performance for the heating and cooling season separately or combined into a single annual value;

b) expressing the performance for windows without possible consideration of adaptive elements, or with;

3) Inclusion or exclusion of other window performance parameters, such as sound insulation, daylight potential, air leakage, comfort parameters;

4) The design of an EU map (options depending on selected variants above);

5) The definition of labelling classes and borders. According the most recent proposal for a revision of the Energy Labelling Directive the top two classes (A-B) have to be empty when the label is introduced.

6) The option for offering a tool to calculate the performance of packages of windows;

These aspects are discussed in more detail in the paragraphs below. The attached proposed implementing measure shows the alternative approaches in clearly marked text.

3.1.1. Scope

This section discusses the technical scope (which window types and features will be covered) and the scope of application (which applications of windows will be covered).

3.1.1.1. Technical scope

The scope of the measure is aligned with the scope of the harmonised standard hEN 14351-1 applicable to windows for buildings. Alignment ensures that manufacturers are aware which products are within the scope of the EU energy label and which products are not.

This means that the following types of windows are in principle included:

- façade windows;
- roof windows;
- window doors.

According to the scope of hEN 14351-1:2006+A1:2010 the following products are excluded: roof lights, curtain walling, windows subject to regulations on smoke leakage and resistance to fire and windows for escape routes.

(for definitions, see proposed measure)

Regarding roof windows the majority of current window labelling schemes (with the exception the UFME scheme in France, the ift scheme in Germany and the ASEFAVE scheme in Spain) do not issue labels for roof windows.

If roof windows where to be placed outside the scope:

1) the proposed implementing measure would be more aligned to existing energy labelling schemes for windows

2) the energy and emission savings would be reduced by 1% (scenario B, year 2030).

Table 1 Comparing scenario analysis of residential facade windows with and without roof windows

year 2030	Residential (façade)		Roof windows		Residential façade + roof windows		Difference res.+roof vs res. only		Difference res.+roof vs res. only	
	BAU	Scen. B	BAU	Scen. B	BAU	Scen. B	BAU	Scen. B	BAU	Scen. B
Sales (10^6 m^2) 2030	156	156	14	14	170	170	-14	-14	-8%	-8%
Stock (10^9 m^2) 2030	4.4	4.4	0.4	0.4	5	5	0	0	-8%	-8%
Heating energy cons. (TWh/yr fuel equivalents)	153	103	15	15	168	117	-15	-15	-9%	-13%
Cooling energy cons. (TWh/yr fuel equivalents)	28	27	12	12	40	38	-12	-12	-30%	-31%
Saved energy (TWh/yr fuel equivalents)		52		1		52		-1		-1%
GHG emissions (Mt CO_2 eq.)	32.1	23.4	5.2	5.1	37.2	28.5	-5	-5	-14%	-18%
Saved emissions (Mt CO_2 eq.)		8.7		0.1		8.7		0		-1%

As roof windows contribute only in a small degree to the overall savings identified, it may be appropriate to exclude roof windows from the scope of the Delegated regulation. This option should be discussed.

Consultation 1. "Technical scope"

Regarding the scope of the EU energy label for windows, which alternative is preferred?:

1. the scope is all windows within the scope of standard EN 14351-1
2. the scope is all windows within the scope of standard EN 14351-1, with the exception of roof windows

3.1.1.2. Application scope

The preparatory study concluded that the most appropriate scope of application is replacement windows in the residential sector. There were several reasons stated in the preparatory study for this conclusion:

- In the case of new buildings, for both residential and non-residential applications, virtually all MS have requirements in place that require assessment of the overall energy performance of the building. This overall performance is heavily influenced by the design and characteristics of the windows applied. New buildings require involvement of building specialists (architects, building physicists, builders, public authorities that assess building plans, etc.). Therefore the study authors concluded that the added benefit of a label for windows for new buildings is small, and a large majority of stakeholders involved in the preparatory study agreed with this;
- In the case of replacement of old windows by new ones, there is in general a difference in approach between the residential sector and the non-residential sector. In the non-residential sector replacement of windows, or fenestration or façade elements, is more often at a larger scale which requires much more often involvement of building specialists and energy performance assessment at the same level as new buildings, applying a holistic approach.
- Apart from these practical considerations, there are also limitations regarding the administrative side of labelling: The development of calculation methods for establishing the energy performance of windows in non-residential applications is much more challenging than for the residential sector: The variety of non-residential buildings is immense and probably much larger than in the residential sector (the non-residential sector covers various subsectors such as offices, health care buildings, educational buildings, hotels and restaurants, sports facilities, wholesale and retail trade buildings and other types of energy-consuming buildings[15] such as churches, military buildings, airports, train stations, etc.). As the design and use of such buildings is much more diverse, the boundary conditions that would need to be considered are also much more diverse. Window-to-floor ratios vary considerably, as do internal heat gains, ventilation rates, hours of usage, temperature set points, and many other conditions. Such larger variations in boundary conditions have a significant impact on the energy performance of different design options / window types. In practical terms coverage of the non-residential sector would probably mean that a multitude of labelling schemes would need to be established and operated (assuming agreement can be reached), for windows of which one can not be sure what the final application is. What or how many labels would then need to be attached to windows in general?
- For the above reasons most existing window energy labelling schemes focus on windows for residential applications, more specifically replacement windows.

It is possible to set no limits as regards the scope of the label or the application areas of the windows covered, but care should be taken that the current available method for establishing the energy performance of windows is based on residential applications. Consumers of windows should be aware that the label is based on conditions more applicable to residential applications,

By limiting the scope to residential applications the scope of the label and the methods for assessing energy performance would be better aligned.

[15] This list is based on Annex I of Directive 2010/31/EU.

Consultation 2. "Application scope"

Regarding the scope of application, which alternative is preferred?:

1. the application scope should be limited to the residential sector only
2. the application scope should not be limited, thus covering non-residential applications as well[16]

3.1.2. Window energy performance / combined or separate

The window energy performance is actually a calculation of the heating demand, representing the amount of heating energy (related exclusively to the window itself) that needs to be supplied to keep the room temperature at set point level, and a calculation of the cooling demand, representing the amount of cooling energy (related exclusively to the window itself) to be supplied to keep the room temperature at set point level.

As it is virtually impossible to make calculations for each specific window sold to a consumer, the calculation of the energy performance of a labelled window relies on simple equations for heating and cooling performance as defined according to the preparatory study. These equations require as inputs window characteristics that (possibly) need to be declared following the CE marking of windows, in accordance with the CPR, established for standard window dimensions.

The performance is expressed in $kWh/(m^2.yr)$ whereby a lower value signifies a better performance. As windows can let more (solar) heat in than is lost, the heating performance can be negative in given circumstances. A cooling performance of more than zero means that the heat gains exceed the heating needs, increasing the risk for 'overheating' of the room. This excess heat is assumed to be removed by artificial cooling, and this is expressed as cooling performance. The cooling performance can never be negative as there is no free source of cold. The cooling performance is mainly determined by the g_W value of the window (or better, if shading is used, the effective g value: $g_{W,eff}$).

The equations have been developed for three conditions representing the average EU climate ('Central'), a very cold climate ('North') and a very warm climate ('South). The preparatory study also presented a cooling performance rating method based on the g_W / $g_{W,eff}$ as an alternative to climate dependent (kWh based) ratings.

As can be seen in the above, in its simplest form, the energy performance of a window can be expressed as a separate heating and cooling performance. However, some stakeholders have argued for the consideration of the combined heating and cooling performance into a single value as basis for rating.

Each of these two alternatives has its own advantages or disadvantages and these should be discussed by the Consultation Forum members.

- Separate performance ratings have the advantage that they provide plain, undisguised information, allowing consumers to assess for themselves which performance values to take into account or give a larger weight in the final decision. Some stakeholders

[16] This requires formulation of additional parameters (requires further study) and possibly 'double labelling' of windows (as it is not always known beforehand in which application the window will be used).

have argued that this approach may guide consumers that have no overheating problem to focus on heating performance only, ignoring cooling performance, and thus opting for a window that does introduce an overheating problem (which then needs to be counteracted by application of solar shading devices or by artificial cooling).
Additionally, in most MS the requirements defined for the window (at product level) are in general separate for heating and cooling. Therefore separate performance ratings could be integrated in the national legislation more easily.

- A combined performance rating has the advantage that it simplifies the label. But as the cooling performance is automatically included in the overall performance this approach may guide consumers that have no overheating issue to opt for a window that have a good performance because of its better cooling performance (by having an IGU Insulated Glass Unit with low g value) whereas the heating performance is all they care about. The risk in this case is that such windows also reduce free solar heat gain in wintertime, adding more energy demands for heating then reducing cooling demands.

The matter is also reflected in the different approaches applied by the various existing labelling schemes which may present separate performances or just for heating only (mainly applied by schemes in northern countries), or the combined performance (mainly applied by schemes in southern countries).

This matter cannot be resolved by having additional analysis and making more calculations, as the difference is actually how consumers would respond to a label design and what risks this may entail. Hence, the possibility of having separate or combined performance ratings should be discussed.

Consultation 3.

Which alternative is preferred: heating and cooling performance shown separately or combined?

1. heating and cooling performance should be shown separately;
2. heating and cooling performance should be combined into a single value.

In certain schemes that are based on the combined performance, a 'summer comfort' indicator is added, to allow a better consideration and comparison of the cooling performance of the window. This option is discussed in paragraph 4.1.3.2.

3.1.2.1. Definition of label class borders / separate performance

Connected to the discussion on which performance to show on the label, is the discussion on how energy label classes should be defined. For the approach based on separate heating and cooling performance it is not necessary that heating and cooling performance are on the same scale, using the same units.

A. Heating performance

The heating performance calculated for various window types is shown below. The values are based on the 'family house' approach, assuming ventilative cooling, and parameter C based on activation of the adaptive element between sunset/sunrise. For façade windows ABC values for 'North' are respectively: 103, 267 and 0.65, for 'Central': 67, 238 and 0.65 and for 'South': 23, 256 and 0.65. Values for roof windows are respectively 'North': 103, 336 and 0.66, 'Central': 67, 304 and 0.65 and 'South': 23, 340 and 0.65. The additional thermal resistance of the adaptive element is 0.17 W/(m^{2}K).

Table 2 Heating performances $P_{E,H,W}$[17]

FACADE WINDOWS and WINDOW DOORS				ROOF WINDOWS			
without adaptive elements	North	Central	South	without adaptive elements	North	Central	South
U_W 5.8 / g 0.85	588	340	14	$U_{W,des}$ 6.6 / g 0.85	629	354	-17
U_W 2.8 / g 0.78	193	88	-64	$U_{W,des}$ 3.2 / g 0.78	196	79	-101
U_W 1.7 / g 0.65	71	16	-74	$U_{W,des}$ 2.1 / g 0.65	80	12	-103
U_W 1.3 / g 0.6	39	-3	-74	$U_{W,des}$ 1.7 / g 0.6	51	-4	-100
U_W 1 / g 0.55	17	-14	-72	$U_{W,des}$ 1.1 / g 0.55	1	-33	-102
U_W 0.8 / g 0.6	-13	-36	-85	$U_{W,des}$ 0.9 / g 0.6	-32	-57	-118
U_W 1 / g 0.58	11	-19	-77	$U_{W,des}$ 1.1 / g 0.58	-6	-39	-109
U_W 0.6 / g 0.47	-9	-28	-67	$U_{W,des}$ 0.7 / g 0.47	-22	-43	-92
U_W 2.8 / g 0.35	273	160	13	$U_{W,des}$ 3.2 / g 0.35	297	170	1
U_W 1.3 / g 0.35	85	39	-29	$U_{W,des}$ 1.7 / g 0.35	110	49	-40
U_W 0.8 / g 0.35	34	6	-41	$U_{W,des}$ 0.9 / g 0.35	27	-4	-59
with adaptive elements (ΔR = 0.17 W/(m^2.K))				with adaptive elements (ΔR = 0.17 W/(m^2.K))			
U_W 5.8 / g 0.85 adaptive el.	393	216	-29	$U_{W,des}$ 6.6 / g 0.85 adaptive el.	393	204	-69
U_W 2.8 / g 0.78 adaptive el.	132	50	-78	$U_{W,des}$ 3.2 / g 0.78 adaptive el.	120	31	-118
U_W 1.7 / g 0.65 adaptive el.	45	-1	-79	$U_{W,des}$ 2.1 / g 0.65 adaptive el.	43	-11	-111
U_W 1.3 / g 0.6 adaptive el.	23	-13	-78	$U_{W,des}$ 1.7 / g 0.6 adaptive el.	25	-20	-106
U_W 1 / g 0.55 adaptive el.	7	-21	-74	$U_{W,des}$ 1.1 / g 0.55 adaptive el.	-11	-40	-104
U_W 0.8 / g 0.6 adaptive el.	-20	-40	-87	$U_{W,des}$ 0.9 / g 0.6 adaptive el.	-40	-62	-120
U_W 1 / g 0.58 adaptive el.	1	-26	-80	$U_{W,des}$ 1.1 / g 0.58 adaptive el.	-18	-47	-112
U_W 0.6 / g 0.47 adaptive el.	-13	-30	-68	$U_{W,des}$ 0.7 / g 0.47 adaptive el.	-27	-46	-93
U_W 2.8 / g 0.35 adaptive el.	212	121	-1	$U_{W,des}$ 3.2 / g 0.35 adaptive el.	221	122	-15
U_W 1.3 / g 0.35 adaptive el.	69	29	-33	$U_{W,des}$ 1.7 / g 0.35 adaptive el.	84	33	-46
U_W 0.8 / g 0.35 adaptive el.	27	2	-42	$U_{W,des}$ 0.9 / g 0.35 adaptive el.	19	-9	-61

When defining energy class borders this Working Document is following the suggestion of the Commission Services [18] to leave empty the first two classes at the time of introduction of a new label. As the consideration of the adaptive element modifies the energy performance,

[17] This table is based on Table 42 of Task 7 with ABC according 'family house', and C according 'sunset/sunrise'.

[18] Proposal for a Regulation of the European Parliament and of the Council setting a framework for energy efficiency labelling and repealing Directive 2010/30/EU, Brussels, 15.7.2015, COM(2015) 341 final

and pending on the outcome of the discussion in the consultation Forum, two classification tables have to be proposed: A table that applies in case windows are only assessed as 'bare' windows (no adaptive elements considered) and a second table that applies in case adaptive elements will be considered.

A single classification for all climate conditions is not an option if the top classes have to remain empty, as the same window has very much different absolute performances pending on the climate conditions.

1. Classification and labelling if performance based on 'bare' window

To keep the top classes empty, the class B boundary has to lie just without reach of the current best performing window type. This defines threshold for class B. Thresholds for class F are defined in such a way so that most windows in these markets fill as much as possible the remaining five energy classes. Intermediate values (and the value for class A) are based on linear steps between classes.

Table 3 Heating class boundaries, no adaptive elements considered, class AB empty

	FAÇADE (kWh/m^2)			ROOF (kWh/m^2)		
Class	North	Central	South	North	Central	South
A	P≤-27	P≤-50	P≤-99	P≤-54	P≤-76	P≤-134
B	-27<P≤-14	-50<P≤-37	-99<P≤-87	-54<P≤-33	-76<P≤-58	-134<P≤-119
C	-14<P≤-1	-37<P≤-24	-87<P≤-75	-33<P≤-12	-58<P≤-40	-119<P≤-104
D	-1<P≤12	-24<P≤-11	-75<P≤-64	-12<P≤9	-40<P≤-23	-104<P≤-89
E	12<P≤25	-11<P≤3	-64<P≤-52	9<P≤30	-23<P≤-5	-89<P≤-74
F	25<P≤39	3<P≤16	-52<P≤-41	30<P≤51	-5<P≤12	-74<P≤-59
G	P>39	P>16	P>-41	P>51	P>12	P>-59

The rating of 11 window types will then be as follows.

Table 4 Heating performance rating, no adaptive elements considered, class AB empty

Façade windows				Roof windows			
Facade window	North	Central	South	Roof window	North	Central	South
Uw 5.8 / g 0.85	G	G	G	Uw 6.6 / g 0.85	G	G	G
Uw 2.8 / g 0.78	G	G	D	Uw 3.2 / g 0.78	G	G	D
Uw 1.7 / g 0.65	G	F	D	Uw 2.1 / g 0.65	G	F	D
Uw 1.3 / g 0.6	F	E	D	Uw 1.7 / g 0.6	F	F	D
Uw 1 / g 0.55	E	D	D	Uw 1.1 / g 0.55	D	D	D
Uw 0.8 / g 0.6	C	C	C	Uw 0.9 / g 0.6	C	C	C
Uw 1 / g 0.58	D	D	C	Uw 1.1 / g 0.58	D	D	C
Uw 0.6 / g 0.47	C	C	D	Uw 0.7 / g 0.47	C	C	D
Uw 2.8 / g 0.35	G	G	G	Uw 3.2 / g 0.35	G	G	G
Uw 1.3 / g 0.35	G	G	G	Uw 1.7 / g 0.35	G	G	G
Uw 0.8 / g 0.35	F	F	F	Uw 0.9 / g 0.35	E	F	F

2. Classification and labelling with adaptive elements considered

If adaptive elements are considered, the heating classes could be defined as shown below.

Table 5 Heating class boundaries, adaptive elements considered, class AB empty

	FACADE (kWh/m^2)			ROOF (kWh/m^2)		
Class	North	Central	South	North	Central	South
A	P≤-35	P≤-54	P≤-101	P≤-62	P≤-80	P≤-137
B	-35<P≤-22	-54<P≤-42	-101<P≤-89	-62<P≤-42	-80<P≤-64	-137<P≤-122
C	-22<P≤-9	-42<P≤-30	-89<P≤-77	-42<P≤-22	-64<P≤-48	-122<P≤-106
D	-9<P≤4	-30<P≤-18	-77<P≤-65	-22<P≤-2	-48<P≤-32	-106<P≤-91
E	4<P≤17	-18<P≤-6	-65<P≤-53	-2<P≤18	-32<P≤-16	-91<P≤-75
F	17<P≤30	-6<P≤6	-53<P≤-41	18<P≤38	-16<P≤0	-75<P≤-60
G	P >30	P>6	P>-41	P>38	P>0	P>-60

The table below shows the rating for windows with adaptive elements considered (also if ΔT of adaptive element is zero (m^2.K)/W).

Table 6 Heating performance rating, adaptive elements considered, class AB empty

Façade windows				Roof windows			
No adaptive elements (ΔR=0)							
Facade window	North	Central	South	Roof window	North	Central	South
Uw 5.8 / g 0.85	G	G	G	Uw 6.6 / g 0.85	G	G	G
Uw 2.8 / g 0.78	G	G	E	Uw 3.2 / g 0.78	G	G	D
Uw 1.7 / g 0.65	G	G	D	Uw 2.1 / g 0.65	G	G	D
Uw 1.3 / g 0.6	F	F	D	Uw 1.7 / g 0.6	G	F	D
Uw 1 / g 0.55	E	E	D	Uw 1.1 / g 0.55	E	D	D
Uw 0.8 / g 0.6	C	C	C	Uw 0.9 / g 0.6	C	C	C
Uw 1 / g 0.58	D	D	C	Uw 1.1 / g 0.58	D	D	C
Uw 0.6 / g 0.47	C	D	D	Uw 0.7 / g 0.47	C	D	D
Uw 2.8 / g 0.35	G	G	G	Uw 3.2 / g 0.35	G	G	G
Uw 1.3 / g 0.35	G	G	G	Uw 1.7 / g 0.35	G	G	G
Uw 0.8 / g 0.35	F	F	F	Uw 0.9 / g 0.35	F	F	G
With adaptive elements (ΔR=0.17)							
Uw 5.8 / gt 0.085	G	G	G	Uw 6.6 / gt 0.085	G	G	F
Uw 2.8 / gt 0.078	G	G	C	Uw 3.2 / gt 0.078	G	G	C
Uw 1.7 / gt 0.065	G	F	C	Uw 2.1 / gt 0.065	G	F	C
Uw 1.3 / gt 0.06	F	E	C	Uw 1.7 / gt 0.06	F	E	C
Uw 1 / gt 0.055	E	D	D	Uw 1.1 / gt 0.055	D	D	D
Uw 0.8 / gt 0.06	C	C	C	Uw 0.9 / gt 0.06	C	C	C
Uw 1 / gt 0.058	D	D	C	Uw 1.1 / gt 0.058	D	D	C
Uw 0.6 / gt 0.047	C	C	D	Uw 0.7 / gt 0.047	C	D	D
Uw 2.8 / gt 0.035	G	G	G	Uw 3.2 / gt 0.035	G	G	G
Uw 1.3 / gt 0.035	G	G	G	Uw 1.7 / gt 0.035	G	G	G
Uw 0.8 / gt 0.035	F	F	F	Uw 0.9 / gt 0.035	F	F	F

B. Cooling performance

The cooling performance can in essence be based on the same approach (calculate performance, define classes for three conditions, rate windows), but the preparatory study shows on Task 7, table 55, page 86, that having a triple classification for cooling (meaning separate classes for all three conditions considered) actually removes the climate condition as relevant parameter. The cooling performance of windows can just as well be based on the g_W / $g_{W,eff}$ value of the window (depending on whether adaptive elements are considered).

This means that the only equation required is that of the $g_{W,eff}$

Equation 1

$$g_{W,eff} = (1 - F_F) \cdot [(1 - Z) \cdot g + Z \cdot g_t]$$

The $g_{W,eff}$ is the g value of the glazing corrected by the frame fraction (F_F), and where appropriate corrected by use of an adaptive element, changing the solar factor of the transparent element (g_t). For a proper consideration of adaptive elements, also the time the adaptive element is activated (parameter Z) must be defined.

For the cooling performance whether it's based on $g_{W,eff}$ or on other approaches, it is not realistic to keep the top two energy classes empty as the limits of performance and technological development are well defined (a $g_{W,eff}$ of zero allows no solar energy to be transferred through the window, meaning the window is practically a solid, non-transparent, screen). Therefore no rescaling is to be expected in the coming years (unless the methodology is changed drastically or other aspects are considered).

The table below shows a possible classification table for the cooling performance. The Z value used to calculate $g_{W,eff}$ is 0.65 (see preparatory study Task 7: if a different value for Z is recommended, the table has to be revised).

Table 7 Example classification of cooling performance

Class	Class boundaries (-)	class difference
A	$g_{W,eff} \leq 0.10$	
B	$0.10 < g_{W,eff} \leq 0.13$	0.03
C	$0.13 < g_{W,eff} \leq 0.19$	0.06
D	$0.19 < g_{W,eff} \leq 0.28$	0.09
E	$0.28 < g_{W,eff} \leq 0.40$	0.12
F	$0.40 < g_{W,eff} \leq 0.55$	0.15
G	$0.55 < g_{W,eff}$	

Based on the above classification, the cooling performance of the window can be assessed if the gt is known, and the parameter Z is chosen.

The gt can also be expressed as the shading coefficient Fc which is the ratio of gt to g..

Equation 2

$$F_c = \frac{g_t}{g}$$

The table below shows the ratings for several possible configurations of windows. A window without adaptive elements (or rated as such) would be rated according the column for Fc = 1 (one) and Z = 0 (zero).

A window with adaptive elements with Z = 0.66 and Fc = 0.10 (very effective external solar shading), 0.4 (external shading with higher solar transmittance) or 0.7 (typical internal shading) would be rated as shown below.

These are just typical values, the actual rating of the window will of course depend on the g for the glazing, the gt (determined by the Fc) and the Z value.

Table 8 Cooling performance rating

Facade/Roof windows										
	Fc =	1	0.1	0.4	0.7	Fc =	1	0.1	0.4	0.7
	Z =	0	0.66	0.66	0.66	Z =	0	0.66	0.66	0.66
g	Ff	$g_{W,eff}$	$g_{W,eff}$	$g_{W,eff}$	$g_{W,eff}$					
0.85	0.30	0.60	0.24	0.36	0.48		G	D	E	F
0.78	0.30	0.55	0.22	0.33	0.44		F	D	E	F
0.65	0.30	0.46	0.18	0.27	0.36		F	C	D	E
0.6	0.30	0.42	0.17	0.25	0.34		F	C	D	E
0.55	0.30	0.39	0.16	0.23	0.31		E	C	D	E
0.6	0.30	0.42	0.17	0.25	0.34		F	C	D	E
0.58	0.30	0.41	0.16	0.25	0.33		F	C	D	E
0.47	0.30	0.33	0.13	0.20	0.26		E	C	D	D
0.35	0.30	0.25	0.10	0.15	0.20		D	A	C	D
0.35	0.30	0.25	0.10	0.15	0.20		D	A	C	D
0.35	0.30	0.25	0.10	0.15	0.20		D	A	C	D

In case no adaptive element is to be considered in the cooling performance of the window, then the classification can be based on g_W only (which is the g value of the glazing, corrected by the frame fraction). This approach ignores the possible benefits of windows with adaptive elements (external, internal shading devices, etc.) even if sold together with the window.

The cooling performance of a window combined with an adaptive element supplied by a third party or already installed on the building (existing shutters, etc.) is outside the scope of the regulation. The effect of the adaptive element on the cooling performance shall not be considered in such cases.

3.1.2.2. Definition of label class borders / combined performance

For the approach based on the combined performance heating and cooling performance need to be expressed using the same units, therefore parameters for the cooling performance need to be defined as well.

The equations are presented in *Annex VIII – Measurement and calculation methods* of the proposed implementing measure and the calculation parameters are presented in the Appendix to this Working Document. The parameters assume as 'single room' calculation method for determination of parameters for both heating and cooling performance.

As explained in the preparatory study, the single room model shifts the energy demand from heating to cooling (reaching/maintaining heating set point requires less energy input, reaching/maintaining cooling set point requires higher energy input).

The calculated **combined** performances of various window types are presented in the table below. For windows with adaptive elements the C-value assumes activation between 22 to 6 hrs, the Z-value applies to conditions exceeding 300 W/m^2 irradiance and the gt is based on an Fc of 0.1 (very good shading).No correction for possible presence of RAC (Room Air Conditioners) is applied.

Table 9: Combined performances[19]

FACADE WINDOWS				ROOF WINDOWS			
without adaptive elements	North	Central	South	without adaptive elements	North	Central	South
U_w 5.8 / g 0.85	560	333	256	$U_{W,des}$ 6.6 / g 0.85	620	370	435
U_w 2.8 / g 0.78	216	130	184	$U_{W,des}$ 3.2 / g 0.78	257	163	355
U_w 1.7 / g 0.65	102	63	140	$U_{W,des}$ 2.1 / g 0.65	146	98	286
U_w 1.3 / g 0.6	72	44	125	$U_{W,des}$ 1.7 / g 0.6	116	79	262
U_w 1 / g 0.55	50	31	112	$U_{W,des}$ 1.1 / g 0.55	68	51	234
U_w 0.8 / g 0.6	27	18	117	$U_{W,des}$ 0.9 / g 0.6	48	41	252
U_w 1 / g 0.58	47	30	117	$U_{W,des}$ 1.1 / g 0.58	66	51	246
U_w 0.6 / g 0.47	22	15	92	$U_{W,des}$ 0.7 / g 0.47	40	34	198
U_w 2.8 / g 0.35	257	153	110	$U_{W,des}$ 3.2 / g 0.35	287	170	184
U_w 1.3 / g 0.35	96	58	82	$U_{W,des}$ 1.7 / g 0.35	133	83	162
U_w 0.8 / g 0.35	51	31	75	$U_{W,des}$ 0.9 / g 0.35	65	45	152

[19] Performance based on ABC and XYZ parameters defined for 'single room' approach, as defined for each climate condition, with C according '22/6' and ventilative cooling assumed.

with adaptive elements (Fc = 0.1)				with adaptive elements (Fc = 0.1)			
U_W 5.8 / g 0.85 adaptive el.	461	261	118	$U_{W,des}$ 6.6 / g 0.85 adaptive el.	493	257	112
U_W 2.8 / g 0.78 adaptive el.	179	97	66	$U_{W,des}$ 3.2 / g 0.78 adaptive el.	202	96	65
U_W 1.7 / g 0.65 adaptive el.	84	42	43	$U_{W,des}$ 2.1 / g 0.65 adaptive el.	112	49	46
U_W 1.3 / g 0.6 adaptive el.	58	28	37	$U_{W,des}$ 1.7 / g 0.6 adaptive el.	88	36	40
U_W 1 / g 0.55 adaptive el.	40	17	31	$U_{W,des}$ 1.1 / g 0.55 adaptive el.	48	15	32
U_W 0.8 / g 0.6 adaptive el.	18	4	30	$U_{W,des}$ 0.9 / g 0.6 adaptive el.	28	3	31
U_W 1 / g 0.58 adaptive el.	36	15	32	$U_{W,des}$ 1.1 / g 0.58 adaptive el.	45	13	33
U_W 0.6 / g 0.47 adaptive el.	15	4	24	$U_{W,des}$ 0.7 / g 0.47 adaptive el.	25	4	25
U_W 2.8 / g 0.35 adaptive el.	225	129	55	$U_{W,des}$ 3.2 / g 0.35 adaptive el.	244	129	51
U_W 1.3 / g 0.35 adaptive el.	85	46	30	$U_{W,des}$ 1.7 / g 0.35 adaptive el.	112	55	32
U_W 0.8 / g 0.35 adaptive el.	45	23	23	$U_{W,des}$ 0.9 / g 0.35 adaptive el.	52	22	23

Same as for the heating performance two classification tables have to be developed if the top two classes are to remain empty, in case of no adaptive elements considered or if they are considered.

A. Combined performance, no adaptive elements considered

The first table covers the class boundaries for windows without consideration of adaptive elements.

Table 10 Combined performance class boundaries, no adaptive elements, class AB empty

	FACADE (kWh/m^2)			ROOF (kWh/m^2)		
Class	North	Central	South	North	Central	South
A	P≤8	P≤2	P≤46	P≤20	P≤17	P≤117
B	8<P≤21	2<P≤14	46<P≤73	20<P≤39	17<P≤33	117<P≤151
C	21<P≤34	14<P≤26	73<P≤101	39<P≤58	33<P≤49	151<P≤185
D	34<P≤46	26<P≤38	101<P≤129	58<P≤77	49<P≤65	185<P≤218
E	46<P≤59	38<P≤50	129<P≤156	77<P≤96	65<P≤81	218<P≤252
F	59<P≤72	50<P≤63	156<P≤184	96<P≤116	81<P≤98	252<P≤286
G	P>72	P>63	P>184	P>116	P>98	P>286

The rating of the various window types is shown below.

Table 11 Combined performance rating

Façade windows				**Roof windows**			
facade window	North	Central	South	Roof window	North	Central	South
Uw 5.8 / g 0.85	G	G	G	Uw 6.6 / g 0.85	G	G	G
Uw 2.8 / g 0.78	G	G	F	Uw 3.2 / g 0.78	G	G	G
Uw 1.7 / g 0.65	G	F	E	Uw 2.1 / g 0.65	G	F	F
Uw 1.3 / g 0.6	F	E	D	Uw 1.7 / g 0.6	F	E	F
Uw 1 / g 0.55	E	D	D	Uw 1.1 / g 0.55	D	D	E
Uw 0.8 / g 0.6	C	C	D	Uw 0.9 / g 0.6	C	C	E
Uw 1 / g 0.58	E	D	D	Uw 1.1 / g 0.58	D	D	E
Uw 0.6 / g 0.47	C	C	C	Uw 0.7 / g 0.47	C	C	D
Uw 2.8 / g 0.35	G	G	D	Uw 3.2 / g 0.35	G	G	C
Uw 1.3 / g 0.35	G	F	C	Uw 1.7 / g 0.35	G	F	C
Uw 0.8 / g 0.35	E	D	C	Uw 0.9 / g 0.35	D	C	C

B. Combined performance, adaptive elements considered

In case adaptive elements are considered, the classification table can be as follows

Table 12 Combined performance class boundaries, with adaptive elements, class AB empty

	FACADE (kWh/m^2)			ROOF (kWh/m^2)		
Class	North	Central	South	North	Central	South
A	P≤3	P≤-7	P<11	P≤-7	P≤-18	P<11
B	3<P≤14	-7<P≤3	11<P≤22	-7<P≤24	-18<P≤2	11<P≤22
C	14<P≤25	3<P≤13	22<P≤33	24<P≤55	2<P≤22	22<P≤33
D	25<P≤36	13<P≤23	33<P≤44	55<P≤85	22<P≤41	33<P≤44
E	36<P≤47	23<P≤32	44<P≤55	85<P≤116	41<P≤61	44<P≤55
F	47<P≤58	32<P≤42	55<P≤66	116<P≤146	61<P≤80	55<P≤66
G	P>58	P>42	P>66	P>146	P>80	P>66

The table below shows the rating for windows with adaptive elements considered (also shown: without adaptive elements, using same class boundaries).

Table 13 Combined performance rating

Façade windows				Roof windows			
No adaptive elements	North	Central	South	No adaptive elements	North	Central	South
Uw 5.8 / g 0.85	G	G	G	Uw 6.6 / g 0.85	G	G	G
Uw 2.8 / g 0.78	G	G	G	Uw 3.2 / g 0.78	G	G	G
Uw 1.7 / g 0.65	G	G	G	Uw 2.1 / g 0.65	F	G	G
Uw 1.3 / g 0.6	G	G	G	Uw 1.7 / g 0.6	E	F	G
Uw 1 / g 0.55	F	E	G	Uw 1.1 / g 0.55	D	E	G
Uw 0.8 / g 0.6	D	D	G	Uw 0.9 / g 0.6	C	D	G
Uw 1 / g 0.58	E	E	G	Uw 1.1 / g 0.58	D	E	G
Uw 0.6 / g 0.47	C	D	F	Uw 0.7 / g 0.47	C	D	G
Uw 2.8 / g 0.35	G	G	G	Uw 3.2 / g 0.35	G	G	G
Uw 1.3 / g 0.35	G	G	G	Uw 1.7 / g 0.35	F	G	G
Uw 0.8 / g 0.35	F	E	G	Uw 0.9 / g 0.35	D	E	G
With adaptive elements (Fc=0.1)				With adaptive elements (Fc=0.1)			
Uw 5.8 / gt 0.085	G	G	G	Uw 6.6 / gt 0.085	G	G	G
Uw 2.8 / gt 0.078	G	G	F	Uw 3.2 / gt 0.078	G	G	F
Uw 1.7 / gt 0.065	G	F	D	Uw 2.1 / gt 0.065	E	E	E
Uw 1.3 / gt 0.06	F	E	D	Uw 1.7 / gt 0.06	E	D	D
Uw 1 / gt 0.055	E	D	C	Uw 1.1 / gt 0.055	C	C	C
Uw 0.8 / gt 0.06	C	C	C	Uw 0.9 / gt 0.06	C	C	C
Uw 1 / gt 0.058	D	D	C	Uw 1.1 / gt 0.058	C	C	C
Uw 0.6 / gt 0.047	C	C	C	Uw 0.7 / gt 0.047	C	C	C
Uw 2.8 / gt 0.035	G	G	E	Uw 3.2 / gt 0.035	G	G	E
Uw 1.3 / gt 0.035	G	G	C	Uw 1.7 / gt 0.035	E	E	C
Uw 0.8 / gt 0.035	E	D	C	Uw 0.9 / gt 0.035	C	C	C

3.1.3. Window energy performance / consideration of adaptive elements and other performance parameters

3.1.3.1. Adaptive elements as energy performance rating element

The energy performance of a window is not only influenced by the static elements of a window (the thermal transmittance, the solar factor of the glazing, the air leakage and frame fraction). Also adaptive (or 'dynamic') elements, if present in the window as placed on the market, can influence the performance.

Examples of adaptive or dynamic elements of windows are solar shading devices like shutters, screens, louvres, etc. that may be located at the exterior or interior side of the window, or integrated in the IGU, including electrochromic IGU's and related technologies. All these elements are covered by the same performance standard for windows EN 14351-1 and are therefore within the suggested scope of the proposed measure.

Reduction (=improvement) of the heating performance is achieved by reduction of the thermal transmittance of the window in periods without useful solar heat gains (after sunset, in the heating season), for instance by lowering roller shutters.

Adaptive shading devices, including adaptive glazing, can improve (= reduce) the cooling performance by reducing solar gains during periods of excessive solar irradiance, thereby reducing the risk for overheating of the room.

The concept of adaptive windows fits the strategies set out for improving the energy efficiency of the building stock (new and existing) as advocated by many experts on energy performance of buildings, and is supported by various EU research projects that contribute to development of adaptive facades.

However, especially in the case of manually operated shading devices (adaptive elements), there is little information on how they are used by the average consumer. The French study referenced in the preparatory study[20] indicates that many consumers are aware that shading devices can be used to reduce energy needs for heating and cooling, but is considered not sufficient evidence for the Commission to be used a basis for expressing the primary energy performance of windows. The standards used for assessment of heating and cooling performance include a method, but this assumes a more or less 'ideal' consumer/user.

Complicating this matter is the fact that shading devices are also used for other needs, such as reducing daylight levels (in offices, bedrooms, etc.), reducing glare, avoid burglary /theft, privacy, reduce noise, etc.

In the preparatory study it is argued that consideration of the performance of the windows with activated adaptive elements, even if based on this 'ideal' use of adaptive devices, makes consumers more aware that energy can be saved in this way. Showing both the performance without adaptive elements and with adaptive elements gives an outlook of how much the performance of the standard (static) product can be improved.

Some stakeholders have argued that this approach may guide consumers to select windows that require intensive and proper use of shading devices, and as they are not exhibiting this proper behaviour in real life, could result in suboptimal windows.

Having consulted various stakeholders, it is felt that a compromise needs to be struck between

[20] Consumer research study of use of moveable shading devices by IPSOS France, commissioned by SOMFY in 2009.

1. the fact that operable [21]adaptive elements offers a relatively easy and energy efficient alternative for reducing possible overheating compared to air conditioners which rely on electric power to operate.
2. the fact that solar control glazing (windows with a low g-value) can also reduce the risk for overheating, but in wintertime may increase heating energy as solar gains are reduced throughout the whole year.

The consideration of adaptive elements is included in the assessment of window energy performance.

Consultation 4.

In case the energy performance is expressed as a 'bare' window, the performance of the window with adaptive elements activated, should be shown (if appropriate).

1. yes, add the performance of the adaptive window;
2. no need for the performance of the adaptive window.

3.1.3.2. Summer comfort indicator

Certain existing window labelling schemes show, besides the main energy performance rating, also a 'summer comfort' rating, which is based on the cooling performance (or a derived value) only[22].

For consumers with a special interest in avoiding overheating, this indicator could be useful in identifying and selecting more suitable windows.

The performance indicator can be based on the g_W (g value of glazing corrected by frame fraction, see Section 3.1.2.1 "B - Cooling performance"), $g_{W,eff}$ (g_W corrected by use of adaptive elements), or on the calculated cooling performance in kWh/yr (including or excluding use of adaptive elements, see Section 3.1.2.2 and Appendix 6.2).

The option of a summer comfort indicator in case the performance is a combined performance should be discussed. The rating can be shown on the label.

Consultation 5.

In case the energy performance is expressed as a combined value, a 'summer comfort' indicator should be added.

3. yes, add a summer comfort indicator.

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[21] This refers to the fact that in order to reap the full benefits of shading devices, the device needs to be controllable and adaptive to changing conditions, i.e. not a fixed overhang.

[22] In the UFME scheme (for France) 'summer comfort' is the need for cooling to maintain the internal temperature below the set point of 26 ° C. It is expressed in absolute terms, with letters from A to G in reference to a specific scale. The 'summer comfort' is considered particularly relevant for the Mediterranean climate (climate zone Z3) and for roof windows (source: http://www.etiquette-energie-menuiserie.fr/outil, accessed 16 July 2015).

a. based on g_W (no adaptive elements considered, just g of glazing and frame fraction);

b. based on $g_{W,eff}$ (adaptive elements is considered, need to define Z value);

c. based on kWh/(m^2.yr), for South climate only, without adaptive elements;

d. based on kWh/(m^2.yr), for South climate only, <u>with</u> adaptive elements;

4. no need for a summer comfort indicator.

One can argue that the same arguments for showing a 'summer comfort indicator' can also be applied for 'winter comfort' as many persons in Europe, also those living in Southern conditions, may be interested in reducing heating bills. An example is the Portuguese voluntary window labelling scheme[23] that shows the combined performance, and separate summer and winter performances.

Consultation 6.

In case the energy performance is expressed as a combined value, a 'winter comfort' indicator should be added.

1. yes, add a winter comfort indicator (based on heating performance in kWh/(m^2.yr).
2. no need for a winter comfort indicator.

3.1.4. Other window performance parameters

Various stakeholders have asked the EU Energy Label for windows to include in the label additional information on energy and non-energy related performance parameters than energy.

The most often cited 'additional' performance parameters are:

1. U_W of window;
2. g value of 'basic' window (g_W) and/or with adaptive elements ($g_{W,eff}$);
3. sound insulation;
4. daylight potential.

For a certain number of parameters the inclusion in the proposal means that suppliers have to declare performance for parameters that they have not already measured / tested as not all Member States require this information. This situation is in conformity with the CPR and the relevant harmonised standard which allows suppliers to show 'npd' (no performance determined) for all but one performance parameter.

It is expected that for sound insulation an unknown share of suppliers will need to have their products tested, incurring additional costs and administrative burden.

Light transmittance is stated in the CE label of the IGU and no additional administrative burden is expected.

[23] See: http://www.anfaje.pt/Cache/Energy_Labelling_of_Windows-1593.pdf (last accessed July 2015)

An alternative to alleviate some of the possible additional costs and burden related to extra testing is to make the provision of this 'additional' information voluntary (meaning the supplier can decide to declare no performance). This option should be discussed.

Consultation 7.

The following additional performance parameters should be included in the EU energy label in the following way.

1. Thermal transmittance (U_W of window, in $W/(m^2.K)$)
    a. yes, mandatory
    b. optional
    c. do not include on label.
2. Solar heat gain coefficient (g value of window, dimensionless) for static window without adaptive elements:
    a. yes, mandatory
    b. optional
    c. do not include on label.
3. Solar heat gain coefficient ($g_{W,eff}$ value of window, dimensionless) for window with adaptive elements activated:
    a. yes, mandatory
    b. optional
    c. do not include on label.
4. Sound insulation (dB):
    a. yes, mandatory
    b. optional
    c. do not include on label.
5. Daylight potential (dimensionless):
    a. yes, mandatory
    b. optional
    c. do not include on label.

All information elements shall have a designated space on the label. The final design of the symbol or logo can be detailed later on.

3.1.5. Design of an EU map

Many stakeholders have asked for inclusion of a map on the label to give more information to consumers about the basis of the energy performance assessment. It should help them to interpret which window would perform better in conditions more appropriate to their specific conditions.

3.1.5.1. Separate heating and cooling performance

Such a map is already prescribed for EU Energy labels for space heating and cooling appliances, including water heaters and combination heaters.

Figure 2 Space heater map according 811/2013

Figure 3 Solar water heater map according 812/2013

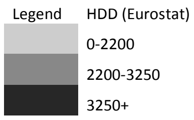
Source: http://eepf-energylabelgenerator.eu/en/eepf-labels/label-type/space-heaters/label/heat-pump-1

The space heater map is based on zones based on 'design temperatures' (coldest outdoor temperature at three consecutive days) which is indicative for space heater sizing. For windows a map based on heating degree days (HDD) is more suitable as the difference in indoor and outdoor temperatures is most relevant for persons interested in the heating performance of the window. Such a degree day based map resembles the space heater map quite closely (I).

As an alternative (II) one can show a map with the reference conditions highlighted. This map requires more understanding of the consumers to assign their conditions to one of the reference conditions.

Figure 4 Option for an EU map for heating performance, source VHK, 2015

I - Heating zones, based on HDD



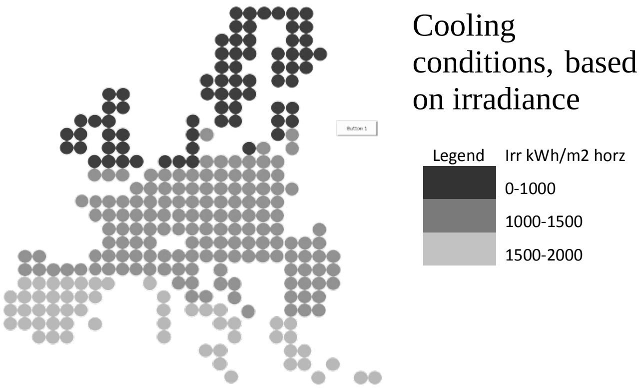
II - Reference conditions (Helsinki, Strasbourg, Athens)

Note: The design presented above is somewhat different than the map used in 811/2013 as the preparatory study created images based on NUTS 2 regions of the EU and a pixelated map of the EU. The HDD are selected to resemble the original map, but by selecting other thresholds levels for 'zones' the borders can be reassigned.

The water heater map in 812/2013 is based on zones of solar irradiance, which is also considered indicative for the possibility of overheating due to too much solar gains. This Working Document however proposes to base cooling performance on g_W (for the window, without consideration of adaptive elements), or $g_{W,eff}$ (if adaptive elements are considered) which is not climate condition dependent.

If however a cooling performance based on calculated energy (kWh/m^2.yr) is preferred, then a map based on irradiance is considered appropriate.

Figure 5 Option for an EU map for cooling performance, source VHK, 2015



3.1.5.2. Combined heating and cooling performance

For a window energy performance based on a combined heating and cooling performance, a map is not simple to generate as heating degree days and solar irradiance cannot be added to each other. This working document presents two possible solutions to this problem.

The first approach is to simply show the locations of the reference conditions, and have consumers assess by themselves which performance would be more appropriate to consider. Such a map is shown below, showing the approximate location of the reference conditions (blue = Helsinki/FI, green = Strasbourg/FR, orange = Athens/EL).

Figure 6 EU map of location of reference conditions

The second approach is based on conventions for defining climate zones based on heating degree days (HDD) and cooling degree days (CDD). It can be shown that CDD and irradiance levels are linked (see figure 7 in the consolidated Task 7 report, page 74).

For the EU a map like shown below can be defined, based on thresholds levels of HDD and CDD (it should be noted that other threshold levels will lead to a different zoning). This map is based on HDD according NUTS 2 regions (which have been assigned or distributed over one or more 'pixels') and solar irradiance levels, converted to CDD data as defined for major EU cities and inter-/extrapolated to other 'pixels'.

Figure 7 EU map of combined HDD and CDD based zones[24]

light zone: CDD > 500, HDD < 2800

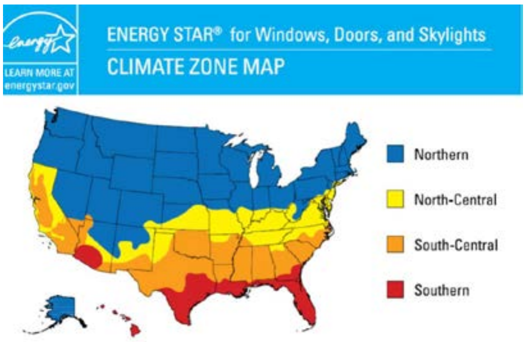
mid zone: CDD ≤ 500, HDD < 2800

dark zone: HDD ≥ 2800

[24] The HDD are based on heating degree days as established according Eurostat conventions. The CDD are an approximation based on solar irradiance levels in Europe and CDD at base temperature of 18ºC for several EU cities.

Similar maps, also based on HDD and CDD, are used in other window labelling schemes, such as in the ENERGY STAR for windows in the USA and in Canada.

Figure 8 Zones in USA ENERGY STAR for windows



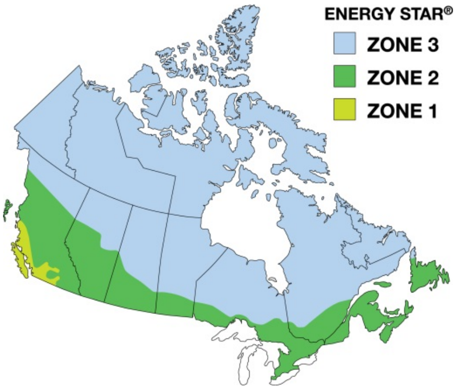
Source: http://www.energystar.gov/ia/products/windows_doors/Promotional_Map.pdf?7976-1ec3

Remark:

Zones are based on International Energy Conservation Code 2006 (IECC) and modified by ENERGY STAR for simplification. IECC uses criteria based on HDD and CDD to define zones.

Note that zones for ENERGY STAR for windows zones have been altered repeatedly over the last couple of years.

Figure 9 Zones in Canada ENERGY STAR for windows



Source: http://www.nrcan.gc.ca/energy/products/categories/fenestration/13954

Remark:

Zone 3: >= 6000 HDDs

Zone 2: >= 3500 to < 6000 HDDs

Zone 1: < 3500 HDDs

Consultation 8.

An EU map should /should not be shown on the EU Energy Label for Windows:

1. yes, show an EU map indicating reference zones (two maps for 'separate heating/cooling' or single map if 'combined performance').
2. yes, a map should be shown, but different to the ones presented in this Working Document
3. do not show an EU map at all.

3.1.6. *Tool to calculate package performance: Installer label*

As stated in the preparatory study[25] the specification of the optimal window requires also a proper consideration of site-specific aspects that cannot be addressed in a generic EU wide Energy Label.

Stakeholders that have expressed a support for an EU window energy label have stated that a more site specific assessment of window performance would be appreciated. In the preparatory study this is referred to as an 'installer label'.

The introduction of an EU Energy Label for windows allows an opportunity to generate such a more site specific 'installer label' through application of various internet tools.

The purpose of this tool is that suppliers (also consumers) of windows can make an assessment of the replacement of one or more windows, for one or more replacement scenarios (window alternatives).

The assessment tool would consider the following elements:

1. type of window: by insertion of performance characteristics of window (as present on label, CE marking or technical fiche);
2. size of window, by varying the frame fraction (guidance or 'wizard' required);
3. orientation of window, by reference to parameters AB for heating and XY for cooling performance by orientation (N, E, S, W);
4. use of adaptive elements, by reference to parameters C for heating and Z for cooling performance by orientation (N, E, S, W), requires inputs related to the adaptive element, to be provided by the supplier;
5. OPTIONAL: The tool may be able to take into account certain installation aspects such as a large overhang present (or trees, nearby buildings that cast shadows).

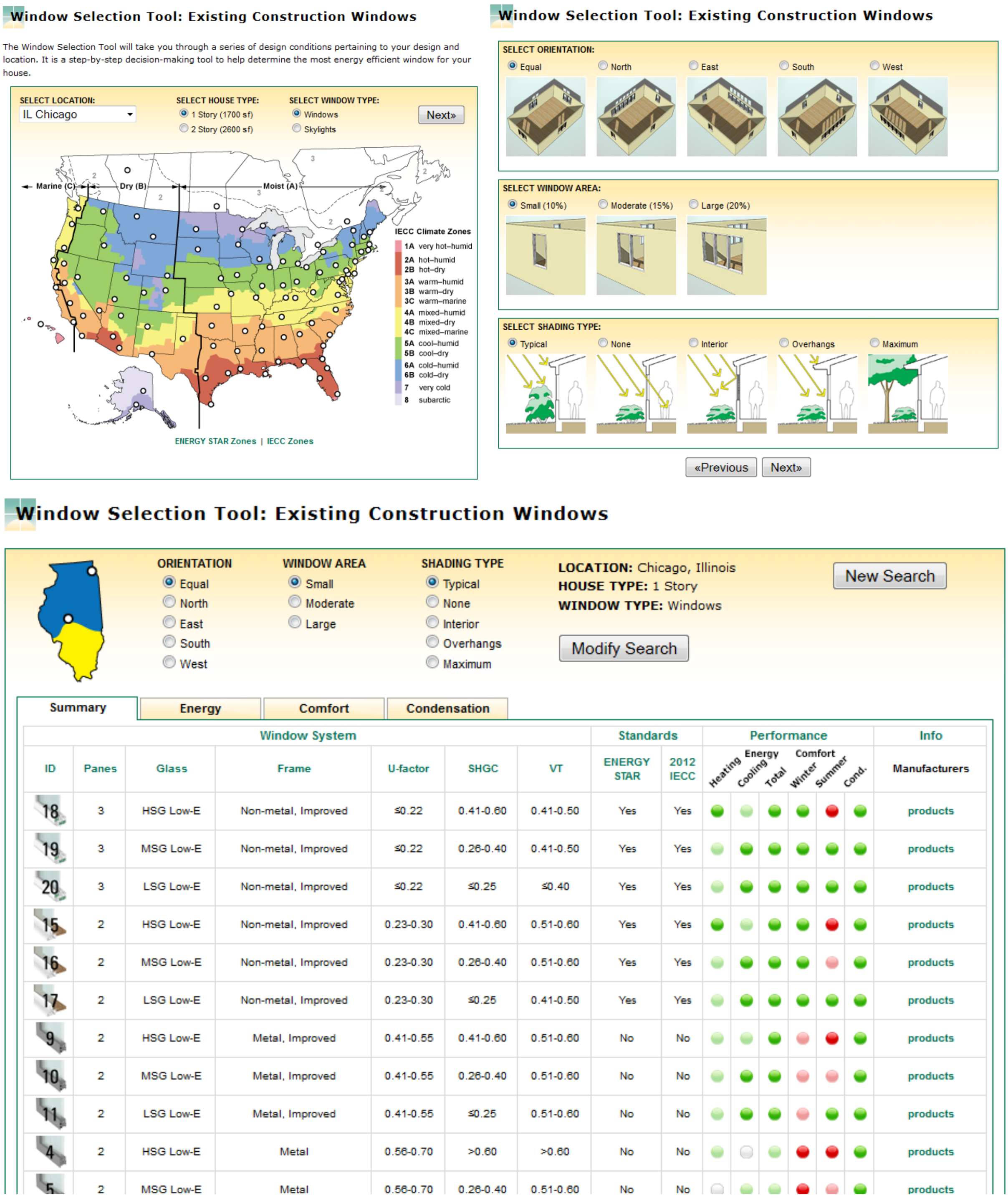
The tool could be accessed through internet from the physical label itself by including a QR code on the label.

An example of such a window calculation tool is shown below

(visit: http://www.efficientwindows.org/existing_selection1.php).

[25] Task 7, section 3.2.1, 'How to improve the environmental performance of windows installed in buildings?', page 6-7, of 22 June 2015.

Figure 10 Window selection tool by www.efficientwindows.org



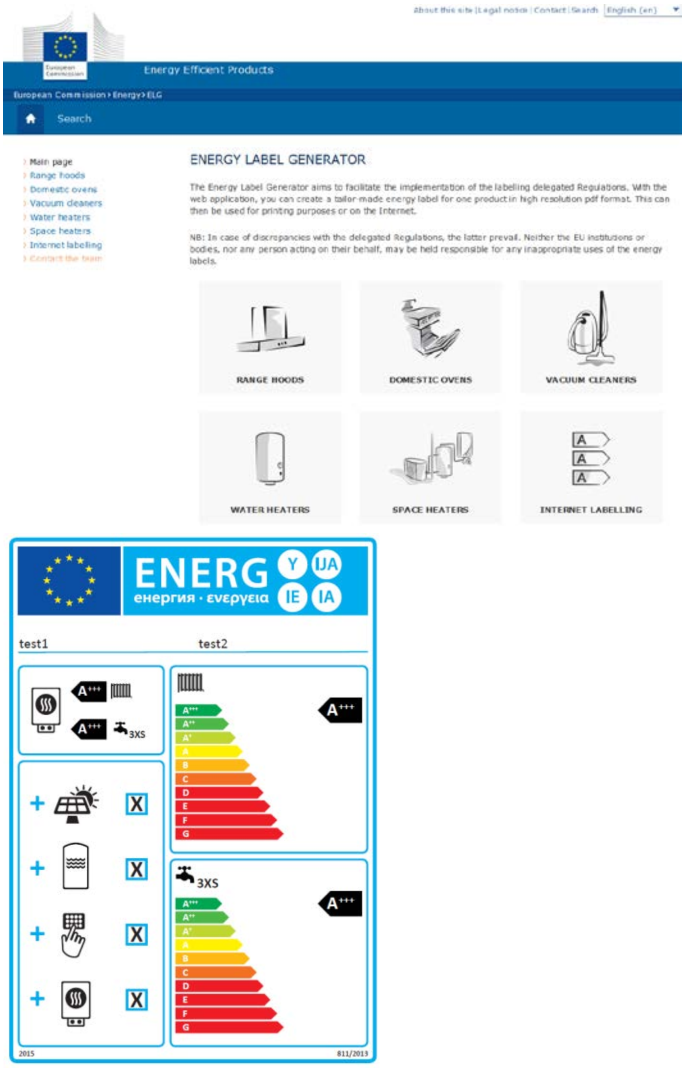
When applied in the context of EU Energy Labelling of windows such a tool would NOT generate a **rating** (energy class A-G) as this is the sole responsibility of the supplier of the window.

However, it would allow a more detailed assessment of the performances of windows in the assessment (probably to be expressed in kWh/(m^2.yr) using the data provided in the EU

Energy Label. The consumer would be able to compare various packages or configurations of products.

The above tool combines elements that are already available via Commission websites, such as the ***EC Energy Label generator*** (http://eepf-energylabelgenerator.eu/) and the ***Tyre Savings Calculator*** (http://ec.europa.eu/energy/sites/ener/files/documents/fuel_savings_calculator_en.xls).

Figure 11 EC Energy Label generator (left: main input selector, right: example of result)



Combined these tools allow the user to enter data on an EU website (or a tool downloaded from an EU website) that is using the declared performance and gives more information on use-aspects not covered by the main label itself.

Calculating performance for three climate conditions is already possible using the information from the preparatory study. In theory it is possible, through extrapolation and interpolation, to generate calculation parameters for other locations in the EU (representing a different set of climatic conditions).

Consultation 9.

The Commission Services should develop a (web-based) tool to generate 'installer labels':

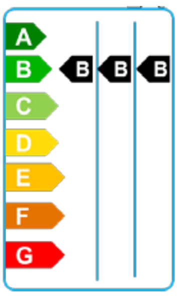
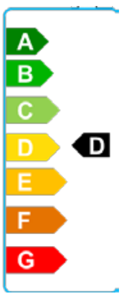
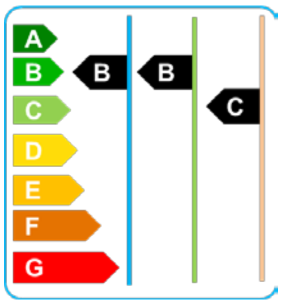
1. yes, develop this tool;
2. no, don't develop this tool.

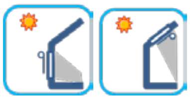
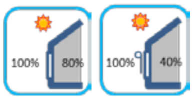
However, adding 'non-residential' windows to such a tool would be considered a 'bridge too far' as the differences in building characteristics and use are much more pronounced than for residential buildings.

3.1.7. Summary of label design

The below label design shows the various options.

Figure 12 EC Energy Label options for Windows

Label design	**<u>Separate</u> heating and cooling performance**		**<u>Combined</u> heating and cooling performance**
Consultation 2: **Main energy performance rating**	design A heating 	cooling 	design B combined 
Symbols for heating or cooling **(as in 626/2012/EU)** **(other)**	for heating  	for cooling  	(not required)
Consultation 6: **Possible EU map**	heating 	cooling 	combined 

Consultation 3: **Additional performance for adaptive element activated**	A A A	A	A A A	
Consultation 4: **"Summer comfort" indicator**	(not required)		A B C D E F G ..or..	A
Consultation 5: **Other performance characteristics**		A symbol can be added to show what type of adaptive element is incorporated (different symbols for exterior, integrated, interior). For adaptive glazing the same symbol as for integrated adaptive element (into IGU) could be used (symbol not shown).		
NOTE! The symbols may be changed when a proposal is developed further	U_W = 1.3	U_W (W/(m^{2}K))		
	gW = 0.6 / gW,eff = 0.6	g_W value (-) $g_{W,eff}$ value, if adaptive element is present (-)		
		acoustic performance (dB)		
		daylight potential (-) daylight potential with adaptive element (-)		
Consultation 7: **Installer label**		On the label: QR code (QR=Quick Response)		

3.1.8. Summary of product information sheet

Directive 2010/30/EC calls for the provision of product fiches, that present label information and other information as required by delegated acts. In the revised (proposal for the) Energy Label Directive the fiche is called product information sheets.

It is proposed that these product information sheets present the data of the Label itself (A-G performance, U_W value, g_W value, possibly $g_{W,eff}$, daylight potential factor, sound insulation) and supplementary data such as the performance expressed in kWh/(m^2.yr), the thermal transmittance of the window plus the adaptive element activated ($U_{W,s}$ where relevant), the solar factor (g and g_t if adaptive element activated) and the air leakage class.

Table 14 Product information sheet

Fiche information façade or roof windows	value (+ unit)	
Heating energy performance	Energy performance .. kWh/(m^2.yr)	Label rating A-G
Cooling energy performance	Energy performance .. kWh/(m^2.yr)	Label rating A-G
OR … Combined energy performance	Energy performance .. kWh/(m^2.yr)	Label rating A-G
Thermal transmittance of window, without adaptive element activated (U_w)	(W/m^2.K)	
Thermal transmittance of window, with adaptive element activated ($U_{W,S}$)	(W/m^2.K)	
Solar factor, without adaptive element activated (g)	(-)	
Solar factor, with adaptive element activated (g_t)	(-)	
Daylight potential, without adaptive element activated (τ_v)	(-)	
Daylight potential, with adaptive element activated ($\tau_{v,t}$)	(-)	
Air leakage (class)	(class 1, 2, 3 or 4)	
Sound insulation	(dB)	

For roof windows the values shall be established, where relevant, for a pitch of 40º to the horizontal, in particular the thermal transmittance.

3.1.9. Determination of the characteristics of the window

The characteristics of a window necessary for the calculation of

- the (heating/cooling/combined) energy performance index,
- the daylight potential factor (to be discussed)

shall be determined in accordance with the relevant product standards hEN 14351-1 and hEN 13659 considering the specifications according to the following table.

Table 15 Determination of the characteristics of the window

Symbol	Characteristic	Unit	Source
U_W	Thermal transmittance of the window	$W/(m^2K)$	Determination according to hEN 14351-1 using the two standard dimensions
$U_{W,S}$	Thermal transmittance of the window with adaptive element closed	$W/(m^2K)$	Determination according to EN ISO 10077-1 or EN ISO 12567-1, using the two standard dimensions according to hEN 14351-1
ΔR	Additional thermal resistance of the adaptive element	$(m^2K)/W$	Determination according to hEN 13659
Q_{100}	Reference air permeability at a test pressure of 100 Pa	$m^3/(h\ m^2)$	Determination and declaration of the relevant class according to hEN 14351-1,
g	Solar energy transmittance of the transparent part of the window	-	Determination according to hEN 14351-1
g_t	Solar energy transmittance of the transparent part of the window with adaptive element closed	-	Determination according to hEN 14351-1
F_F	Frame fraction of the window	-	Determination according to EN ISO 10077-1
ΔUg	Change in thermal transmittance of the transparent filling element of the window due to inclined installation		Determined according to EN 673 as the difference of the Ug value for vertical installation and the Ug value for an inclination of 40°

3.1.10. Market surveillance

Currently many Regulations under the EU energy labelling Directive contain a sentence such as *"(the model shall be considered to comply) .. if the values and classes on the label and in the product fiche are not more favourable for the supplier than the values in the technical documentation, including test reports"*. In the specific case of windows this sentence would result in obstacles as for instance a lower g-value stated on the label cannot be assessed to be 'more favourable', as a lower g is favourable for the cooling performance, but less favourable for the heating performance.

Additionally, market surveillance of windows must take into account that windows are also covered by the Construction Products Regulation 305/2011. Window characteristics such as the thermal transmittance (U_W), solar gain (g) and class of air leakage (L) are covered by the applicable harmonised standard hEN 14351-1. Member States are responsible for market surveillance of these characteristics.

Therefore the underlying proposal for market surveillance of windows deals with the verification of the overall energy (heating/cooling/combined) performance only, and the resulting classification. Surveillance of underlying window characteristics (U_W, g, etc.) should be dealt with in the way it is currently dealt with under the CPR: the proposal for EU energy labelling of windows proposes no changes to this situation.

This way the various responsibilities as to what parameter is governed by what legislation and whether verification tolerances apply, remains as clear as possible and the additional administrative burden is minimised.

3.2. Legal basis

The proposed Delegated Regulation is an implementing measure pursuant to Directive 2010/30/EC, in particular its Article 10. The Directive is based on Article 194(2) of the Treaty on the Functioning of the European Union[26].

3.3. Subsidiarity principle

Action at local level, for instance the introduction of mandatory energy labelling of windows by individual Member States, could lead to obstacles to the free movement of goods within the Community as suppliers may be confronted with diverging requirements regarding information to be shown and how this information is calculated, including the methods for establishing performance of windows.

In the context of competences shared with Member States, the European level is most relevant in order to meet the objectives set by the Treaties (principle of subsidiarity). It is thus appropriate for the measure in question to be adopted at EU level.

3.4. Proportionality principle

The form of the implementing measure is a Delegated Regulation, which is directly applicable in all Member States. This ensures that national and EU administrations will not incur any costs for transposing the implementing legislation into national legislation.

In accordance with the principle of proportionality, this measure does not go beyond what is necessary in order to achieve the objective.

3.5. Choice of instruments

The proposed form of action is a Commission Delegated Regulation implementing Directive 2010/30/EU, because the objectives of the action can be achieved most efficiently by fully harmonized requirements throughout the EU, thus ensuring the functioning of the internal market with regard for the need to preserve and improve the environment. No costs arise for national administrations for transposition into national legislation.

4. BUDGETARY IMPLICATION

The proposal has no implications for the Community budget.

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[26] Article 194(2) of the TFEU:

> Without prejudice to the application of other provisions of the Treaties, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the measures necessary to achieve the objectives in paragraph 1. Such measures shall be adopted after consultation of the Economic and Social Committee and the Committee of the Regions.
>
> Such measures shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply, without prejudice to Article 192(2)(c).
>
> By way of derogation from paragraph 2, the Council, acting in accordance with a special legislative procedure, shall unanimously and after consulting the European Parliament, establish the measures referred to therein when they are primarily of a fiscal nature.

5. ADDITIONAL INFORMATION

5.1. Review/revision/sunset clause

The proposal includes a revision clause.

5.2. European Economic Area

The proposed act concerns an EEA matter and should therefore extend to the European Economic Area.

6. APPENDIX

6.1. Inputs for heating performance calculation

Assumptions and parameter values to calculate heating performance (based on 'family house' calculation method).

Table 16 Inputs for heating performance calculation

Assumptions		Parameters*	Facade window			Roof window		
			North	Central	South	North	Central	South
Method:	family house	A-uni	103	67	23	103	67	23
vent cooling:	vent cool	B-uni	267	238	256	336	304	340
Uenv:	avg	C-set/rise	0.65	0.65	0.65	0.65	0.65	0.65
Orientation:	uniform							
Cvalue:	C-set/rise							
Fc:	0.10							

* "uni" means uniform orientation of windows (25% north, 25% east, 25% west and 25% south)

6.2. Inputs for combined performance calculation

Assumptions and parameter values to calculate combined performance (based on 'single room' calculation basis).

Table 17 Inputs for combined performance calculation

Assumptions			Facade window			Roof window		
			North	Central	South	North	Central	South
Method:	single room	A-uni	89	53	11	86	49	9
vent cooling:	vent cool	B-uni	161	133	97	156	150	90
Uenv:	avg	C-set/rise	0.35	0.36	0.45	0.35	0.36	0.38
Orientation:	uniform	X-uni	0.5	0.2	-4.1	1.3	1.2	-3.0
Cvalue:	C- 22/6	Y-uni	23	57	341	56	127	659
Fc:	0.10	Z-uni	0.71	0.57	0.68	0.75	0.75	0.88

* "uni" means uniform orientation of windows (25% north, 25% east, 25% west and 25% south)