Lower carbon buildings - a review of energy standards and guidance within Scottish building regulations

Consultation Report and Scottish Government Response

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Acknowledgements

We are grateful to all of the respondents who took the time, effort and opportunity to contribute their views on these building standards review proposals.
Lower carbon buildings - a review of energy standards and guidance within Scottish building regulations

Executive Summary

1. A consultation exercise commenced on the 14 January 2013 to seek comments on proposals to amend Section 6 - (energy) and supporting guidance. The closing date for the consultation was 15 April 2013. Consultation proposals were placed on the Building Standards Division (BSD) website and over 500 individuals and organisations were also notified directly and invited to respond. Consultees were encouraged to respond on any aspect of the proposals, with specific issues targeted for comment by a range of consultation questions.

2. There were 117 valid responses to the specific consultation questions received and a number of respondents submitted additional comments on the content of the proposed revisions to standards or guidance text within the Domestic and Non-Domestic Technical Handbooks. The majority of respondents were content with what was proposed.

3. Question 1 in the consultation document sought general comment on the proposals put forward. A detailed analysis of this element of consultation responses was carried out in relation to the cost, timing and economic impact of the proposals. Analysis of Question 1 identified concerns including the additional costs of meeting the revised standards, and the implications of cost increases on a construction industry only now emerging from recession.

4. This analysis was used to inform the Ministerial Announcement on the 2015 building standards, made on 25 September 2013\(^1\) and is summarised within Annex A of this report. A web link to the full analysis document is also provided\(^2\).

5. Analysis of all technical responses made in response to the consultation is provided by officials from the Building Standards Division (BSD) of the Scottish Government in consultation with the Departmental Working Group charged by Ministers with the development of consultation proposals. This Working Group comprised of local authority verifiers, designers, building services engineers, building physicists, energy modellers, academics and private sector organisations representing the commercial and domestic sector, manufacturing industry, with building standards observers from other UK administrations.

6. Detailed analysis of technical responses is contained in sections 5 of this report. The analysis of respondents' comments did not identify any strong technical barriers or objections to the proposed changes. However, a range of issues have resulted in amendment to aspects of the consultation proposals and recommended further action in support of implementation.

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\(^2\) Published at [www.scotland.gov.uk/Resource/0045/00456701.pdf](http://www.scotland.gov.uk/Resource/0045/00456701.pdf)
7. Following amendment of the technical detail of proposals, in line with the Scottish Government Response in this document, final standards and guidance will be submitted for Ministerial consideration. On approval, changes to regulations will be laid in the Scottish Parliament in August 2014, with the intention that revised Technical Handbooks will be published in October 2014.

8. As announced in September 2013, it is intended that the new standards and supporting guidance will come into force in October 2015.

9. The recommendations of the 2013 Update of the Sullivan Report is also relevant to the subject of this consultation. The report recommended action by government and industry in support of the 2015 standards. Following initial discussions with industry partners, this process and the development of a joint ‘Action Plan’ will take place from July 2014 onwards. Information on The Sullivan report and the Action Plan is available online at www.scotland.gov.uk/sullivanreport.

10. Timetable for implementation:
   July 2014 - Target setting specification confirmed for new buildings; begin Action Plan work.
   August 2014 - Sign-off of final Business & Regulatory Impact Assessment; Lay SSI for amended regulations in parliament
   October 2014 - Publication of Technical Handbooks section 6 (energy) 2015 and supporting guidance; software tools supporting 2015 standards begin to become available.
   December 2014 - Further supporting guidance published; update report on Action Plan discussions & outputs
   May 2015 - BSD Dissemination events begin.
   October 2015 - Section 6 (energy 2015) in force; report on Action Plan discussions & outputs.

1. Introduction

1.1 Scottish building regulations set standards for the health, safety and welfare of persons in and around buildings, furthering the conservation of fuel and power and furthering the achievement of sustainable development. These standards are supported by guidance contained in the Technical Handbooks. Building regulations apply to new buildings and to most work to existing buildings.

2. The Consultation Process

2.1 Before making or amending the building regulations, Scottish Ministers are required to consult such bodies as are considered appropriate to inform on the matters under consideration. This exercise has been carried out through a Working Group and discussions have taken place with local authority verifiers and the industry.

2.2 The consultation exercise was issued to just over 500 public, private sector and third sector organisations, Non-Departmental Public Bodies (NDPB) and individuals and interested parties identified and listed on the BSD consultation inventory. The consultation documents were published on the BSD website as an electronic download, with paper copies issued to all individuals or organisations who requested a hard copy. A total of 1600 organisations and individuals who had previously registered with the BSD for updates were advised of the consultation by email. All were invited to submit comments on the proposals made in the consultation paper by 15 April 2013.

2.3 In total there were 117 responses from the following organisations:

<table>
<thead>
<tr>
<th>Group Type</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Associations/ Manufacturers</td>
<td>38</td>
<td>32%</td>
</tr>
<tr>
<td>Contractor</td>
<td>25</td>
<td>21%</td>
</tr>
<tr>
<td>Local authorities/associations</td>
<td>18</td>
<td>15%</td>
</tr>
<tr>
<td>Individuals</td>
<td>11</td>
<td>9%</td>
</tr>
<tr>
<td>Designers/Consultants</td>
<td>7</td>
<td>6%</td>
</tr>
<tr>
<td>Voluntary/environmental organisations</td>
<td>6</td>
<td>5%</td>
</tr>
<tr>
<td>Commercial organisations</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Professional bodies</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>NDPB/Agencies</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Housing providers/RSLs</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Advisory bodies/Committees</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>117</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
3. Consultation Responses

3.1 As well as welcoming general comment on the detail of the proposals, a list of 18 further questions relating to specific issues were sought from consultees. Not all consultees responded to all questions therefore a summary table of responses to each of the questions is set out below, followed by brief comment and recommendation on each issue.

<table>
<thead>
<tr>
<th>Questions asked</th>
<th>Number of responses</th>
<th>Agree with proposals?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1: General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. General comments on consultation proposals</td>
<td>98</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Whilst specific questions are posed on proposals for Domestic and Non-domestic buildings within sections 2 &amp; 3 of this document, Consultees are encouraged to offer commentary on any aspect of the consultation proposals in the text box below.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Section 2: Domestic buildings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Inclusion of low carbon equipment for the electricity and biomass fuel packages.</td>
<td>81</td>
<td>47 (58%)</td>
</tr>
<tr>
<td>Do consultees agree with this approach?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Addition of PV in place of solar water heating for gas, LPG and oil fuel packages.</td>
<td>79</td>
<td>44 (56%)</td>
</tr>
<tr>
<td>Do consultees agree that for the purposes of calculating the Target Emission Rate (TER), PV kWp should be calculated based on the dwelling floor area?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have and details of how this might be calculated when setting the TER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Introduction of waste water heat recovery systems for all fuel packages.</td>
<td>78</td>
<td>46 (58%)</td>
</tr>
<tr>
<td>Do consultees agree that for the purposes of calculating the Target Emission Rate (TER), the number of WWHR units should be based on dwelling area?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have and details of how this might be calculated when setting the TER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Minimum efficiency for air source heat pumps in fuel package table.</td>
<td>73</td>
<td>43 (59%)</td>
</tr>
<tr>
<td>Do consultees agree with this approach?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have and details of an alternative approach.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Questions asked

<table>
<thead>
<tr>
<th>Questions asked</th>
<th>Number of responses</th>
<th>Agree with proposals?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Improvement to U-values</td>
<td>76</td>
<td>53 (69.7%)</td>
</tr>
<tr>
<td>Do consultees agree with this approach?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have in respect of improvement to U-values.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Conservatories</td>
<td>60</td>
<td>54 (90%)</td>
</tr>
<tr>
<td>Do consultees agree with the revision to U-values for glazed elements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have in respect of improvement in the area-weighted average U-value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Specification of equipment efficiencies and controls.</td>
<td>64</td>
<td>46 (71.9%)</td>
</tr>
<tr>
<td>Do consultees agree that the Domestic Building Services Compliance Guide should form the guidance for compliance with standards 6.3 to 6.6?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Fixed independent space heating appliances.</td>
<td>59</td>
<td>50 (85%)</td>
</tr>
<tr>
<td>Do consultees agree that guidance on fixed independent heating appliances is adopted in Scotland?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have in respect of the introduction of guidance, including minimum efficiencies, on fixed independent heating appliances.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 3: Non-domestic buildings

<table>
<thead>
<tr>
<th>Questions asked</th>
<th>Number of responses</th>
<th>Agree with proposals?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Introduction of new method of setting target emissions rates.</td>
<td>54</td>
<td>47 (87%)</td>
</tr>
<tr>
<td>Do consultees agree with the proposed changes to the methodology under standard 6.1?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please provide commentary in support of your view.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Adoption of variant specifications within target setting.</td>
<td>48</td>
<td>39 (81%)</td>
</tr>
<tr>
<td>Do consultees agree with the proposed specifications for the three building groups under standard 6.1?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments are invited for any aspects of the specifications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Use of low carbon equipment element within target setting</td>
<td>55</td>
<td>40 (73%)</td>
</tr>
<tr>
<td>Do consultees agree with the proposed floor area percentage of PVs included in the notional buildings specification under standard 6.1?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If not, please provide details of the concerns you have.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questions asked</td>
<td>Number of responses</td>
<td>Agree with proposals?</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>13. Credit for use of automatic monitoring and targeting</strong>&lt;br&gt;Do consultees support the introduction of credits when automatic monitoring and targeting (AMT) is installed in a building under standard 6.1? Please provide commentary in support of your view.</td>
<td>44</td>
<td>36 (82%)</td>
</tr>
<tr>
<td><strong>14. Improvement to U-values</strong>&lt;br&gt;Do consultees agree with the proposed backstop values for fabric for the three building groups under standard 6.2? Comments are invited for any aspects of the specifications.</td>
<td>50</td>
<td>35 (70%)</td>
</tr>
<tr>
<td><strong>15. Display glazing</strong>&lt;br&gt;Do consultees agree with the proposal to compensate for any heat loss or gain through display glazing elsewhere in the building? If not, please provide details of the concerns you have.</td>
<td>42</td>
<td>38 (90%)</td>
</tr>
<tr>
<td><strong>16. Curtain walling</strong>&lt;br&gt;Do consultees agree with the proposal to assign a backstop U-value to curtain walling? If so, consultees are encouraged to indicate an appropriate backstop value.</td>
<td>45</td>
<td>36 (76%)</td>
</tr>
<tr>
<td><strong>17. Alternative approach to target setting for large extensions</strong>&lt;br&gt;Do consultees agree with the proposed approach for large extensions?&lt;br&gt;If not, please provide details of the concerns you have.</td>
<td>49</td>
<td>40 (82%)</td>
</tr>
<tr>
<td><strong>18. Specification of equipment efficiencies and controls.</strong>&lt;br&gt;Do consultees agree that the Non-domestic Building Services Compliance Guide should form the guidance for compliance with standards 6.3 to 6.6?&lt;br&gt;If not, please provide details of the concerns you have.</td>
<td>50</td>
<td>42 (84%)</td>
</tr>
<tr>
<td><strong>19. Specific fan power</strong>&lt;br&gt;Do consultees agree with relaxing the maximum specific fan power in air distribution systems for new and existing buildings?&lt;br&gt;If not, please provide details of the concerns you have.</td>
<td>37</td>
<td>30 (81%)</td>
</tr>
</tbody>
</table>

3.2 Excepting question 1, which sought general comments on consultation proposals (and is presented separately in Annex A), the majority of consultees who responded to individual questions were in favour of what was being proposed.
4. **Analysis**

4.1 In addition to views on the specific questions relating to the proposals, a number of responders offered comments or suggestions on the detail of the proposals. To ensure that all comments were considered an external analysis of views within the consultation responses to Question 1 was undertaken. These relate primarily to the cost, timing and economic impact of the proposals (see Annex A).

4.2 The analysis of technical aspects of the consultation, predominantly relating to questions 2 to 19, was carried out by Building Standards Division (BSD) of the Scottish Government in consultation with the Energy Working Group. This working group consists of experienced construction professionals from various sectors of the industry who are familiar with the issues and proposals, having been involved since the initiation of the review.

5. **Findings**

5.1 **General comments on consultation proposals (Question 1)**

“Whilst specific questions are posed on proposals for Domestic and Non-domestic buildings within sections 2 & 3 of this document, Consultees are encouraged to offer commentary on any aspect of the consultation proposals in the text box below.”

Analysis – see Annex A

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**Scottish Government Response**

In consideration of the issues raised in response to the consultation, and the range of responses made to Question 1 in particular, Scottish Ministers issued a formal statement on the timing and extent of the next set of energy standards within building regulations on 25 September 2013. The announcement[^4] advised that consultation proposals, including emissions reductions of approximately 21% for new homes and 43% for new non-domestic buildings, would be taken forward, broadly as consulted upon, but implementation would be deferred until October 2015.

Acknowledging early sight of one of the recommendations made by the reconvened Sullivan Report Panel[^5], Ministers noted that this time will allow a period in which industry and government can work together towards successful delivery of the improved standards.

Note: any technical issues raised in response to question 1 are addressed under the relevant topic within analysis of questions 2-18.

5.2 Section 2: Domestic

5.2.1 Question 2 - Standard 6.1 – Inclusion of low carbon equipment for the electricity and biomass fuel packages.

“In setting the Target Emissions Rate to achieve a 21.4% reduction in carbon dioxide emissions, when compared to current standards (equivalent to a 45% reduction on 2007 energy standards), solar water heating has been removed from all fuel packages and photovoltaic panels (PVs) included in the gas, LPG and oil packages. No further low carbon equipment has been added to the electricity and biomass packages as the primary heating appliance is a renewable technology.

Do consultees agree with this approach?
If not, please provide details of the concerns you have.”

Analysis

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>No preference indicated</th>
<th>Total number of responses</th>
<th>No response to question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>22</td>
<td>12</td>
<td>81</td>
<td>36</td>
<td>117</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group Type</th>
<th>Yes</th>
<th>No</th>
<th>No preference indicated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Associations/Manufacturers</td>
<td>11</td>
<td>10</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Contractor</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Local authorities/associations</td>
<td>13</td>
<td>3</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Individuals</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Designers/Consultants</td>
<td>6</td>
<td>-</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Voluntary/environmental organisations</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Commercial organisations</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Professional bodies</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>NDPB/Agencies</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Housing providers/RSLs</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Advisory bodies/Committees</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>22</td>
<td>12</td>
<td>81</td>
</tr>
</tbody>
</table>

There were 81 responses to Question 2. The majority of responses (47 out of 81) were positive (58%); 22 responses (27%) were negative and 12 responses (15%) provided comment but did not indicate agreement or disagreement with the proposal.

Main Themes
The majority (47) supported the proposal for the oil and biomass fuel packages, agreeing that where the primary heating appliance is a renewable technology then no further renewables should be included in target setting.
Twelve respondents commented that this proposal only affected the Target Emission Rate (TER) and, whilst opposed to restriction on design choices, noted that they would derive SAP calculations based on their own dwelling specification.

Respondents supporting this proposal considered that it recognised electricity generated by renewable means.

Other comments received included:
- A request for additional guidance where designers do not include PVs, as provided in the Non-domestic guidance.
- Agree, provided it does not increase costs when compared to solar thermal systems.

There were 22 responses opposing the proposal, the main views expressed were as follows:
- PV panels should be included in the electricity fuel package, directly deducting CO₂ emissions from the building emission rate as this fuel is generated using fossil fuels.
- While not directly opposing the proposal in respect of electricity and biomass, there was a body of support to retain solar thermal systems in the fuel package table as these mature systems directly reduce the carbon footprint of the dwelling while PV does not reduce a buildings immediate use of fossil fuels. A number of respondents also noted that uptake of solar thermal systems will increase following the introduction of the Renewable Heat Incentive for dwellings.
- Support a ‘fabric first’ approach and therefore do not support the inclusion of low carbon technologies.
- Some concern that it may lead to fuel switching and therefore TERs should be broadly equivalent.

Other comments, unrelated to question 2, included:
- A suggestion that it is better to place restrictions on the performance of equipment at source, stopping the sale of poorly performing equipment.
- A suggestion that the methodology could be improved by following the ‘Passivhaus’ approach.
- One respondent while supporting the proposal did not think that the seasonal performance factor (SPF) should be used to demonstrate compliance.
- One respondent asks why MVHR has been avoided.
- SAP software should be available 6 months in advance.
- The availability of gas absorption heat pumps.
- Use of Smart Electric Thermal Storage for secondary heating.

**Commentary**
- It is recognised that solar hot water is a mature technology but equally that this is the case for PV panels, more widely used following the introduction of initiatives such as Feed-in Tariffs.
- In respect of concerns over this approach encouraging fuel switching, it is noted that all the fuel packages set broadly comparable challenges, with each utilising an element of renewable technology. Consequently, this should continue to enable development based upon the applicant’s choice of fuel(s).
• It is encouraging that there is recognition that measures in the fuel package table are provided solely to set the Target Emission Rate, though this may benefit from being further reinforced. Designers are therefore free to use the most appropriate design choices; including solar hot water technology or a fabric first approach, provided the TER is achieved and they comply with all other provisions within the standards.

• While the electricity generated by PV is not always directly used by the dwelling (surplus being exported), delivered energy and the net consumption of grid-generated electricity (with a fossil fuel generation component and transmission losses) is reduced.

**Question 2 - Standard 6.1 – Inclusion of low carbon equipment for the electricity and biomass fuel packages.**

**Scottish Government Response**

We consider that it remains appropriate to set the electricity and biomass fuel packages using only one renewable technology, adding no further low carbon equipment to the electricity and biomass fuel packages. This proposal will be retained in the final published fuel package table.

In relation to electric heating, this is also considered to support development in remote or rural areas, reducing the cost differential between this and fossil fuel solutions.

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**5.2.2 Question 3 - Standard 6.1 – addition of PV in place of solar water heating for gas, LPG and oil fuel packages.**

“The setting of the Target Emissions Rate now incorporates photovoltaic panels (PVs), recognising the need to promote a reduction in energy demand and that this is now the most mature and readily applicable form of low carbon equipment. The PV kWp in the proposed guidance is based on the dwelling floor area and is also constrained to 50% of the available roof area, taking account of the greater contribution to reduce TER in larger dwellings, where the number of occupants will generally result in greater energy demand.

Do consultees agree that for the purposes of calculating the Target Emissions Rate (TER), PV kWp should be calculated based on the dwelling floor area? If not, please provide details of the concerns you have and details of how this might be calculated when setting the TER.”
There were 79 responses to Question 3. The majority of the responses (44 out of 79) were positive (55.7%); 29 responses (36.7%) were negative and 6 responses (7.6%) provided comment but did not indicate agreement or disagreement with the proposal.

Main Themes
More than half of respondents agreed in principle to this proposal, noting that it is a common way of calculating a proportionate contribution.

While agreeing with the proposal, a number of respondents submitted comments and opinion varied on how the area of PV should be calculated, alternative approaches included:
- number of occupants;
- number of bedrooms;
- kWp linked to dwelling size (e.g. 1 kWp for dwellings less than 100 m² and 2 kWp for dwellings greater than 100 m²); and
- a proposal to apply a reduction factor to dwelling floor area in calculation of PV area in TER in situations where there are limited opportunities available to meet the TER and use of LZCT is also constrained.
Other comments received included:

- Concern that the roof area may not be large enough for an adequately sized PV installation.
- A maximum of 50% of roof area is too high, other limits proposed included 25%.
- Looking ahead to the future it may be more appropriate to calculate the area based on offsetting a percentage of the primary energy demand.
- If calculated on the proposed basis, guidance should make clear that this approach is used only for the purpose of setting the Target Emission Rate (TER).
- There must be greater clarity on how to calculate a floor area and roof area.
- Greater clarity required on how this approach would apply to a block of flats, including where the flats have differing floor areas.
- Area should not be restricted to 50% of roof area and should be calculated by an engineer.
- Should also be linked to geographical location.

The respondents who opposed the introduction of PV panels were of the opinion that it would limit orientation and the flexibility required for different house types, citing an example of a townhouse which has a larger floor area when compared to roof area.

Other comments included:

- The floor area does not determine energy usage.
- Concern that the approach is unsuitable for multiple flatted dwellings.
- It will result in a varying compliant solution across a site.
- Support a simpler approach of 0.5 kWp for dwellings less than 100 m² and 1.0 kWp for dwellings greater than 100 m².
- Disagree with inclusion of low carbon technologies.
- The notional building scenario in SAP does not match reality. The orientation of panels in notional dwelling (SE and SW) is not a site consideration.

Other comments, unrelated to question 3, included:

- Guidance considered very complex.
- Savings in CO₂ from PV array should be declared so that an alternative can be calculated.
- Considers that PV units are not a mature technology and dispute the low carbon credentials when you consider cradle to grave.

**Commentary**

- The principle of calculating the Target Emissions Rate (TER) based on the inclusion of renewables, where the energy is determined using the floor area, is already established in current guidance for solar thermal systems. There is some confusion over the inclusion of PV in the fuel package table in that this is only for the purpose of setting the TER, there being no requirement to use PV or any other specific element within solutions. In terms of the guidance to standard 6.1 it is the target (TER) that should not be exceeded.
- The calculation of PV area based on bedrooms and occupants, which are less easily defined criteria, could create an element of uncertainty and variation and is therefore considered to be less appropriate.
Further modelling was also carried out to assess how dwelling floor area might limit flexibility and concluded that the PV contribution should be based on the dwelling floor area but constrained to maximum level which better recognises that the practicality of such installations where, due to increasing number of storeys, floor area can greatly surpass available roof area. Impact analysis of the effect a more practical limit would have on overall abatement was carried out and proved to be nominal.

**Question 3 - Standard 6.1 – addition of PV in place of solar water heating for gas, LPG and oil fuel packages.**

**Scottish Government Response**

We consider that, for the purposes of calculating the Target Emission Rate (TER), PV kWp contribution should be calculated based on the dwelling floor area as proposed, but with a revised limit of 30% of roof area.

This lower percentage area reflects the practicality of implementing such solutions in taller buildings, effectively capping the contribution to target setting for development of above four storeys. This will be applied within the final fuel package table.

**5.2.3 Question 4 - Standard 6.1 - Introduction of waste water heat recovery systems for all fuel packages.**

“The Target Emissions Rate now incorporates waste water heat recovery (WWHR) technology, recognising the need to promote reduction in energy demand for hot water. For consultation purposes, the number of units incorporated is based on dwelling floor area; dwellings with a floor area greater than 100 m² have 2 WWHR units and 1 unit is applied to smaller dwellings. This approach takes account of the greater contribution to reduce TER in larger dwellings, where the number of occupants will generally result in greater hot water demand.

Do consultees agree that for the purposes of calculating the Target Emission Rate (TER), the number of WWHR units should be based on dwelling area? If not, please provide details of the concerns you have and details of how this might be calculated when setting the TER.”
There were 79 responses to question 4. The majority of the responses (46 out of 79) were positive (58%); 32 responses (41%) were negative and one response (1%) provided comment but did not indicate agreement or disagreement with the proposal.

**Main Themes**

Over half of those who responded to this question supported the proposal but recommended that it should be made clear in guidance that whilst the technology is used for setting the TER, it can be omitted in the actual design of the dwelling.

There were mixed views on using this technology and many, whilst agreeing in principle, thought that other measures should also inform the calculation of number of WWHR units, including:

- number of occupants;
- number of bedrooms;
- dwelling type;
- sanitary ware present;
- white goods, such as dishwashers; and
- An adjustment of the floor area, aligning with the zone control threshold of 150 m².
A number of respondents were opposed to the introduction of WWHR in target-setting as they do not consider that it is a mature technology and therefore limited experience in design, installation and maintenance exists, which may also result in systems underperforming and higher maintenance costs.

A body of respondents were also concerned that WWHR units are predominantly designed for 2 storey dwellings and questioned whether suitable systems exist for single storey dwellings, noting that the most efficient tray system available is 46.9%.

**Commentary**

- In consideration of the issues raised in respect of the calculation of TER, on the proposal that the number of WWHR units is calculated based on dwelling floor area. It was noted that this approach is already established in the existing fuel package table as the means of specifying the number of intermittent extract fans identified within the TER calculation.

- It was noted that, as with proposals for the calculation of PV area, defining the number of WWHR units based on bedrooms and occupants could create an element of uncertainty and variation and was therefore considered to be less appropriate.

- Further modelling carried out to assess the impact of using a 45% efficient WWHR unit (representative of performance achievable from ‘tray’ systems) identified no significant impact on the aggregate carbon dioxide reduction. Recent research on performance of WWHR units shows they can be more effective than anticipated in reducing energy demand.

**Question 4 - Standard 6.1 - Introduction of waste water heat recovery systems for all fuel packages.**

**Scottish Government Response**

We consider that, for the purposes of calculating the Target Emission Rate (TER), it remains appropriate to retain WWHR as an element. The number of WWHR units will be calculated based on the dwelling floor area, but with a slightly reduced efficiency of 45% to better reflect performance achievable from both ‘pipe’ and ‘tray’ systems.

5.2.4 **Question 5 - Standard 6.1 - Minimum efficiency for air source heat pumps in fuel package table.**

“The Target Emissions Rate for the electricity fuel package is based on an air source heat pump with a Seasonal Performance Factor (SPF) of 250%. It is proposed that where measured heat pump data is not available and generic heat pump values are being used then a default Seasonal Performance Factor (SPF) of 230% is used, the proposed default efficiency in SAP 2012. This is to avoid heat pumps, where measured data is not available, assuming a higher efficiency.

Do consultees agree with this approach?

If not, please provide details of the concerns you have and details of an alternative approach.”
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There were 73 responses to Question 5. The majority of the responses (43 out of 73) were positive (59%); 26 responses (35.6%) were negative and 4 responses (5.4%) provided comment but did not indicate agreement or disagreement with the proposal.

**Main Themes**

Just over half of those who responded thought that it was sensible to calculate the TER using a lower Air Source Heat Pump (ASHP) efficiency than that which may be possible in the actual installation. This would encourage specification of higher efficiency products.

In addition to supporting the proposal a number of respondents considered that a Seasonal Performance Factor (SPF) of 230% (SAP 2009) should apply to heat pumps where the heat emitter is identified as underfloor heating and an SPF of 160% (SAP 2009) is applied to heat pumps using radiators. Additionally, in these cases, SAP should assume auxiliary heating and a supplementary immersion.

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Note: in SAP 2012, efficiency will be categorised by output flow temperature rather than emitter type.
Thirty six per cent of responses were opposed to this proposal for a variety of reasons, including:

- It is an unproven technology;
- Designers will develop their own SAP calculations and are opposed to any restrictions on flexibility of design and use of technologies;
- Efficiency value should be consistent with the Domestic Building Services Compliance Guide;
- Concern regarding the long term performance and maintenance of low carbon technologies;
- Only measured heat pump data should be used; and
- SPF is not a constant and varies with ambient temperature and as ASHPs do not work at lower temperatures, legislation should not use them.

**Commentary**

- The SAP 2012 methodology has been revised (published May 2012) and the default efficiency for air source heat pumps (ASHP) has been set at 170% (Table 4a), combining elements from Table 4a and 4c of the previous edition.
- SAP v9.92 introduces an installation factor which enables a higher efficiency to be declared for non-database heat pumps where Microgeneration Certification Scheme (MCS) installation standard MIS 3005 is achieved.
- Seasonal primary energy efficiency ratio (SPEER) is an emerging rating figure reflecting the use of primary energy for all types of heat pump, fossil fuel boiler and gas-driven cogeneration technologies, as well as hybrid systems where solar heating or a heat pump is backed up with electric heating or a fossil fuel boiler. Energy labelling with the SPEER will be mandatory from 2015 under the Energy Labelling Directive. Any later amendment to guidance on product efficiency should be direct and equivalent.

**Question 5 - Standard 6.1 - Minimum efficiency for air source heat pumps in fuel package table.**

**Scottish Government Response**

Recognising changes in the presentation of heat pump efficiency within SAP, an efficiency of 175% using default higher circulation temperature, is equivalent to the previous 250% efficiency for a unit serving radiators. This will be assigned within the TER specification for the electricity fuel package. The application of new SAP guidance on MCS installations within the DER calculation will be considered for final, published guidance. We will provide clear guidance to applicants and verifiers on the use of default efficiency for heat pump within the DER specification for a proposed building.

**5.2.5 Question 6 - Standard 6.1 and 6.2 – Improvement to U-values**

“U-values have been improved throughout guidance (except for floors in the fuel package table, conversion of heated buildings and for ‘standard’ extensions). In improving U-values, it is proposed that the variation in U-values is simplified.”
Area-weighted average U-values for the ‘improved’ extension now align with target U-values used for the ‘notional’ dwelling and area-weighted average U-values for a ‘standard’ extension now align with maximum U-values for new dwellings.

Do consultees agree with this approach?
If not, please provide details of the concerns you have in respect of improvement to U-values.”

Analysis

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There were 76 responses to question 6. The majority of the responses (53 out of 76) were positive (69.7%); 18 responses (23.7%) were negative and 7 responses (6.6%) provided comment but did not indicate agreement or disagreement with the proposal.

Main Themes
The majority of respondents supported this proposal, agreeing that the simplification and standardisation of U-values for buildings is an improvement.
A number of additional comments were received, including:
- A proposal for rooflights to achieve an assessed U-value in the horizontal of 2.2 W/m²K.
- Proposal for the maximum U-value for party walls to be set at 0.
- Proposal that maximum U-values should be better than recommended. One proposal suggested an improvement of 60% and that improvement should link with improvement to heating controls.
- Agree with proposal but on basis that any improvement should be carried out only if reasonably practical.

There were mixed views expressed by those respondents who were opposed to this proposal, including:
- U-values should not be improved for extensions to pre-1983 buildings and therefore should now use the less demanding U-values in column (b).
- Viability of upgrades to the existing building.
- The proposed U-values should be more demanding: 0.15, 0.14, 0.10 and 1.2 for walls, floors, roofs and openings respectively.
- Backstop U-values should be set at 0.19 for walls, 0.15 for floors and 0.13 for roofs.
- Concern that the cavity will require thicker wall ties and may have a detrimental effect on the acoustic performance.
- Increased U-values will have an impact on ventilation and indoor air quality, which will need to improve.
- Improved U-values will reduce flexibility.
- Considers that a clearer way should be found to set out what is intended.
- Predefined U-values can restrict innovations.
- Conversions should achieve U-values in column (a) of the table in clause 6.2.9, bridging the gap with new build.
- Construction of suspended timber floors will be difficult.
- U-value of 1.3 for glazed openings is extremely difficult; therefore support a maximum U-value of 1.6.

Other unrelated comments to question 6 included:
- Proposal does not address the gap in design values when compared to as built values.
- Proposal that SG develop a framework for collecting data on as-built performance to close performance gap.

**Commentary**

- Improved U-values are considered to strike a balance across fabric improvement, cost and flexibility in design.
- Following investigation of U-values for glazing, there is view that it should be relaxed to 1.4 W/m2K in both the fuel package table and in the table to clause 6.2.9 to recognise current available products and solutions.
- The U-value of 0.18 W/m²K for floors has been in place for extensions since 2010, therefore it is proposed that this same U-value proposed in the table to clause 6.2.1 is implemented.
In relation to the more challenging values for extensions in column (a) in clause 6.2.9, it is suggested that greater flexibility may be needed given the challenges these present to small extensions in particular.

Similarly, more clarity in application of U-values to conversions and work to existing buildings, where the ‘reasonably practicable’ approach applies would be beneficial.

It is noted that the ‘performance gap’ between as designed and as built dwellings is addressed under an on-going workstream and ventilation and indoor air quality issues are being considered in future review of Section 3.

Question 6 - Standard 6.1 and 6.2 – Improvement to U-values
Scottish Government Response
We will introduce proposed improvement to U-values, including an adjustment to the maximum area weighted U-value for glazing in the fuel package table and column (a) of the table to clause 6.2.9 from 1.3 to 1.4 W/m²K. The maximum U-value for floors remains as proposed, 0.18 W/m²K.

For extensions, we will introduce greater flexibility for designers enabling the difference in heat loss between area weighted average U-values in ‘column (a)’ versus ‘column (b)’ to be offset by fabric improvement to the existing dwelling.

We will also seek to simplify guidance on the improvement to the performance of existing buildings when undertaking work (conversions and alterations).

5.2.6 Question 7 - Standard 6.2.12 – Conservatories

“To deliver improved energy performance when carrying out work to existing buildings, it is proposed that performance standards for glazing within conservatories be aligned more closely to that specified for other types of extension. Guidance proposes a revised area-weighted average U-value for glazed elements of 1.8.

Do consultees agree with this revision?

If not, please provide details of the concerns you have in respect of improvement in the area-weighted average U-value.”
### Analysis

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There were 60 responses to Question 7. The majority of the responses (54 out of 60) were positive (90%) and 6 responses (10%) were negative.

### Main Themes

Of those responding, an overwhelming majority supported the proposal to improve the U-value for glazed elements within conservatories. Many agreed, provided ‘thermal separation’ is maintained.

While supporting the proposal, a number of additional comments were received:

- an allowance needs to be made for solar gain and the shelter provided to the wall, accounting for the benefits of a sunspace.
- while agreeing with the proposal, would welcome an improvement to the assessment to include the whole dwelling in the target setting approach and require zone controls.
- a view that a conservatory should be treated as an extension.
- compliance of conservatory roofs needs to be explored.
- concern that the increase in cost would prevent many projects commencing.

10% of respondents opposed this proposal. There were mixed views expressed by these respondents, including:

- Do not consider that the proposal would provide any benefit
• Concern that the proposal would limit design flexibility (example - where a conservatory is designed to be a heat collector)
• Standards should only apply to heated conservatories
• Treat conservatories as other ‘extensions’ as they are often used as sitting rooms.

Commentary
• General support for consultation proposal of 1.8 U-value; considered readily achievable.
• Recommend future investigation into the benefits of sunspaces and how any possible benefits can be accounted for in new dwellings.

Question 7 - Standard 6.2.12 – Conservatories
Scottish Government Response
We will apply the proposed area-weighted average U-value for glazed elements of 1.8 W/m²K as originally proposed.
For future review, we will investigate:
• the potential for guidance that will enable the creation of beneficial sunspaces without adverse effect on current provisions applicable to the more common addition of conservatories to dwellings; and
• scope for recognition, within SAP, of sunspaces as part of a new dwelling emissions calculation.

5.2.7 Question 8 - Standards 6.3 to 6.6 Domestic – specification of equipment efficiencies and controls.
“Previously, recommendations on efficiency and controls for building services in guidance to standards 6.3 to 6.6 reproduce information developed for the Domestic Building Services Compliance Guide which support building regulations in England, Wales and Northern Ireland. Recommendations prepared by the Department of Communities and Local Government (DCLG) follow discussion and development with UK industry. The proposal is to directly reference this guidance document within the Technical Handbooks, retaining existing guidance only where not addressed in that document or where guidance specific to Scotland is required.
Do consultees agree that the Domestic Building Services Compliance Guide should form the guidance for compliance with standards 6.3 to 6.6?
If not, please provide details of the concerns you have.”
There were 64 responses to Question 8. The majority of the responses (46 out of 64) were positive (71.9%); 11 responses (17.2%) were negative and 7 responses (10.9%) provided comment but did not indicate agreement or disagreement with the proposal.

**Main Themes**

Of those responding, a majority supported the proposal that the Domestic Building Services Compliance Guide should form the guidance for compliance with standards 6.3 to 6.6, bringing consistency across the UK.

There was some uncertainty regarding the effectiveness of the Guide and a number of comments were received supporting the proposal on condition that:

- the Domestic Building Services Compliance Guide remains freely available;
- clarification is provided on ‘contradictory text’;
- examples are provided, e.g. on the minimum thickness of insulation for hot water cylinders;
- links within the guidance are kept up to date;
- guidance on zone controls is included; and
- sufficient detail is required to be submitted to verifiers to address the requirements of the Domestic Building Services Compliance Guide.

Those who did not support the proposal generally preferred that the relevant parts are incorporated in Scotland specific guidance.
One respondent was concerned that this might mean a change in the procurement of services and another considered that a revised energy efficiency standard might be considered due to the lower seasonal temperatures in Scotland.

**Commentary**
- It is noted that there are areas where Scotland does not currently follow the Domestic Building Services Compliance Guide. The Scottish edition of the guide will be edited to reflect Scottish guidance. Areas already noted include:
  - Replacement of Primary heating appliance (including fuel switching)
  - Reference to the Scottish Condensing Boiler Installation Assessment Guide
  - Reference to Scottish Domestic Ventilation Guide

**Question 8 - Standards 6.3 to 6.6 Domestic – specification of equipment efficiencies and controls.**

**Scottish Government Response**

It has now been established that, to meet regulatory conventions, a single UK guide will not be possible. Instead, a core UK text will be adopted by each administration and tailored as necessary to suit each regulatory framework and references.

A Scottish edition of the Domestic Building Services Compliance Guide will be published as part of the guidance on compliance with standards 6.3 to 6.6.

**5.2.8 Question 9 - Standards 6.3 to 6.6 Domestic – fixed independent space heating appliances.**

“The Domestic Building Services Compliance Guide includes guidance on fixed independent space heating appliances, including minimum efficiencies. Do consultees agree that guidance on fixed independent heating appliances is adopted in Scotland?

If not, please provide details of the concerns you have in respect of the introduction of guidance, including minimum efficiencies, on fixed independent heating appliances.”
There were 59 responses to question 9. The majority of the responses (50 out of 59) were positive (84.7%); 3 responses (5.1%) were negative and 6 responses (10.2%) provided comment but did not indicate agreement or disagreement with the proposal.

Main Themes
A large majority of respondents supported the proposal to include minimum efficiencies on fixed independent heating appliances noting that it would bring consistency across the UK. Respondents objecting and providing comment to the proposal were concerned that the guide includes restrictions on the location and siting of fixed appliances; including flues and that this should not apply in Scotland.

Commentary
- The issue of flue siting (raised in responses) is addressed in Section 3 of the Domestic Technical Handbook and the ‘Guide to the Condensing Boiler Installation Assessment (Scotland)’ which are existing guidance documents.

Question 9 - Standards 6.3 to 6.6 Domestic – fixed independent space heating appliances.
Scottish Government Response
For consistency, guidance on fixed independent heating appliances will be adopted in Scotland.
5.3 Section 3: Non-domestic

5.3.1 Question 10 - Standard 6.1 – Introduction of new method of setting target emissions rates.

“The 2010 carbon dioxide emissions calculation used improvement factors based on the ventilation strategy of each building to address the difference in energy performance. The research undertaken illustrated that due to the variation in the form and use and hence load profile of different building types, a standard set of fabric and building services specifications that would be appropriate for reducing energy consumption and CO₂ emissions for one building may not produce the same result for another.

It is therefore proposed to set a carbon dioxide reduction target based on a current notional building which would achieve a different percentage improvement in carbon emissions for different building types. This means that different buildings will need to achieve a similar level of building specifications, making this approach more equitable across different building types. The current notional building will itself be a compliant solution; however alternative building designs which deliver the same or better carbon performance to that of the notional building are also encouraged.

This approach is similar to the carbon setting standards for new dwellings in Scotland as well as the 2010 revision of Part L of the Building Regulations in England and Wales.

Do consultees agree with the proposed changes to the methodology under standard 6.1?

Please provide commentary in support of your view.”
There are 54 responses to Question 10 of the consultation. 47 responses (87%) were positive, there were 2 (4%) negative responses and the remaining 5 responses (9%) did not indicate agreement or disagreement with the proposal.

Main Themes

Methodology
Some of the respondents acknowledged that the methodology has proven to work in England and Wales for a number of years (note: a similar methodology to the one proposed was introduced in ADL2A for England and Wales in 2010). Common ground between the Scottish Building Standards and Part L is thought to drive a better understanding and increase performance.

Amongst those who agree with the proposal it was noted that the proposed change is fair, as it recognises that it is not possible to ask for the same level of improvement from all buildings. While the Notional Building specifications provide a recipe for compliance, some respondents thought that alternative solutions must be encouraged.

One respondent thought that proposals should be more onerous than the rest of the UK to get back on track for net zero carbon by 2016/17. Another respondent also recommended going further, with independent fabric figures for energy use.
Building types
Two respondents commented on the number of building types (7 out of 23 within the current NCM) that were used as models in the BSD research and felt that there are too many assumptions and variables within the proposal. They also noted the lack of transparency on the exact levels of performance required by certain building types (healthcare and industrial buildings).

‘Specification recipes’
Some concerns raised that publishing the ‘specification recipes’ may hinder innovation, as some designers will opt to follow these ‘recipes’ and not look for other ways of achieving compliance. If the Notional Building specifications are to be published, it was suggested that alternative Notional Buildings be modelled for different scenarios to demonstrate alternative approaches. Others consider the publication of the Notional Building specifications as a significant positive step, adding to transparency.

Low Carbon Equipment (LCE)
In relation to LCE element of the Notional Buildings specifications, one respondent cautioned against offsetting rather than demand reduction. Others noted that the revised standards retain reference to the possibility of incorporating no LCE equipment and asked if this remains realistic given the revised emissions targets.

Inconsistency
Inconsistency of terminology used in reference to ventilation/heating as part of the notional building specification in the technical guidance was noted.

Other comments, not directly related to question 10, noted that:
- Post Occupancy Evaluation would assist in verifying whether the proposed approach delivers lower energy buildings.
- a solar gain limitation similar to the ADL2A approach should be introduced, as well as an air infiltration backstop value for all new buildings.
- fuel factors for off grid fuels should be considered so as not to discourage certain technologies and fuel types.
- modular hire companies will not be able to recover the costs of installing enhanced renewable technologies whose payback period is between 7 to 9 years, as hire projects usually have a duration of up to 5 years.

Commentary
- As this question sought comment on the change to methodology, comments on the level of improvement proposed are considered under question 1.
- Reference to the setting of an independent energy target for fabric is considered out with scope of the current consultation but should remain a consideration for future review and ‘nearly zero energy’ new buildings.
- On concerns expressed over the range of building models used, it is noted that this is comparable with research informing similar review elsewhere in the UK.
- On transparency of levels of performance, it is considered that publication of notional specification provides a practical indication of expectation. On the suggestion for alternative solutions, guidance should reinforce that published specification is for target setting only.
• LCE component within target setting is a necessary and practical reflection of the level of ambition sought in reducing emissions. We will further reinforce that this element does not have to form part of a solution.


Scottish Government Response

We consider that there is support for introduction of the proposed new method of target setting for CO₂ emissions and will implement this accordingly.

The proposed notional building specifications will be further reviewed for clarity and simplicity and applied in target setting in published guidance. This will be supported by a fully revised NCM Modelling Guide for Scotland. Guidance will stress that specification applied for target setting only and reinforce to applicants the importance of investigating alternative scenarios to achieve cost-effective solutions.

5.3.2 Question 11 - Standard 6.1 – Adoption of variant specifications within target setting

“The National Calculation Methodology for Non Domestic buildings in Scotland includes 23 building types which are currently assessed based on the ventilation strategy which is adopted for each of them. The proposed approach for 2013 involves grouping building types based on similar energy profiles. Three building groups have been identified: top-lit (warehouses), side-lit and heated only and side-lit and air-conditioned buildings. As a result, buildings are now assessed on a zone by zone basis, each zone being assigned to one of the building groups.

For the research undertaken a number of different buildings were modelled and their capital and lifetime costs were assessed against the estimated carbon dioxide reductions achieved over time. Through this work different notional building specifications were assigned to each group and the most cost effective fabric and fixed building services specification (from that research) is presented in clause 6.1.4 of the proposed guidance for 2013. These specifications are the proposed notional building specifications to be used for the 2013 standards and guidance.

Do consultees agree with the proposed specifications for the three building groups under standard 6.1?

Comments are invited for any aspects of the specifications.”
There are 48 responses to Question 11 of the consultation. 39 responses (81%) were positive, there were 7 (15%) negative responses and the remaining 2 responses (4%) did not indicate agreement or disagreement with the proposal.

Main themes

Comparison with ADL2A
Some respondents recognised similarities between the proposed Notional Buildings specifications and three building types (side-lit/ heated only, side-lit/ heated and cooled, top lit/ heated only) and the equivalent in ADL2A for England & Wales.

One response highlighted the need to have parity in the backstop values for elements such as rooflights throughout the UK. It was also suggested that the three administrations work together to align their approach for air-conditioned buildings.

Zone by zone approach
Amongst those who agree with the proposed change, the zone by zone approach to assessment is thought to be appropriate as it reflects the different ventilation and heating strategies that may be required in different areas of the same building. It also gives greater guidance to both verifier and designer and should help reduce problems with non-standard usage buildings.
Some respondents commented that this approach should be made clearer in the guidance under clause 6.1.4 and suggested including a diagram illustrating the different terms used. One respondent noted that having differing fabric specifications for different zones means that in calculation the Notional building will be unrepresentative of a real building.

Some respondents queried how the NCM building types fit the three Notional building specifications and noted that top-lit heated and cooled buildings were not included in the three Notional buildings specifications.

**Specifications general**

Amongst those who agreed with the proposed specifications, some commented that the ‘specification recipe’ approach is a reasonable, simple model to follow, which will enable designers involved in smaller non-domestic developments to achieve compliance and reduce design and procurement costs at the same time.

One of the respondents thought that the Notional Building specifications should not be published or, if they are to be published, a range of alternative specifications should be modelled to recognise that cost effectiveness solutions can vary.

**Fabric specification**

There were some responses highlighting the less demanding fabric specification for heated only buildings compared to heated and cooled buildings, this approach being different to the English and Welsh proposals for 2013.

Two respondents argued that ‘good’ fabric specification and minimising solar gain will help prevent all buildings from warming up as much as they help prevent heat loss and that air-conditioned buildings may require additional design criteria to minimise solar gains. They also noted that it is possible that mechanical solutions are more appropriate and sustainable than natural ones in certain buildings.

There were a few responses asking for tougher U-values while others noted that the targets for buildings essentially domestic in character could be improved to levels required for new Domestic buildings.

Air permeability levels were also discussed with values of 3 m³/h/m² @ 50 Pa being suggested for all new buildings and other respondents suggesting that low values (below 5 m³/h/m² @ 50 Pa) are unreasonable especially in larger heated and cooled buildings.

**Building services specifications**

The difference in the performance levels for lighting, DHW, heating and heat recovery amongst the three Notional buildings was questioned. There was also one respondent who disagreed with the inclusion of 4.5% photovoltaic panels for the side-lit Notional buildings specifications.

**Tools and supplementary guidance**

The ‘NCM Modelling Guide for Non-Domestic Buildings in Scotland’ as well as a consultation version of the carbon dioxide emissions calculation tool were not available as part of the consultation package. Some respondents noted this and one
in particular suggested that the proposed specifications could be amended following a review of the calculation tool to ensure that industry is not adversely impacted.

**Inconsistency**

A number of respondents noted that the three categories of the Notional buildings specifications and the relevant table in the proposed guidance should use the same terminology.

One comment, not directly related to question 11 comments noted concern that the emissions standard does not consider CO₂ released as a result of the building process.

### Commentary

- As this question was seeking comment on the specifications for the proposed notional buildings, comments on the methodology are considered under question 10.
- The specifications of the three Notional buildings vary as a result of extensive modelling work which was part of the research that informed the consultation proposals and discussions amongst the WG members. Concerns were expressed in relation to the lower fabric specification for heated only buildings—further commentary in the technical guidance would therefore be helpful.
- On publication of the specifications of the Notional buildings, refer to commentary and response to question 10.
- The zone by zone approach to specification is new and as such needs to be explained in detail in the technical guidance— we suggest an example of this approach be provided in supporting guidance.
- The NCM Modelling Guide, as well as the calculation tool will be made available in advance of the proposed guidance being implemented. This will give designers and industry time to test and get used to the new guidance and consider the implications for the specification of particular building types.
- The aggregate approach to reduction in carbon dioxide emissions can be explained in the technical guidance and relevant examples from existing research be provided, for example in an annex to the NCM guide.

**Question 11 - Standard 6.1 – Standard 6.1 – Adoption of variant specifications within target setting**

**Scottish Government Response**

We consider that that the zone by zone approach to assessment is appropriate and supported by most respondents. It is more transparent and aligns practice in target setting broadly with that used elsewhere in the UK. However, on its adoption, additional guidance will be provided to explain how this zone approach is applied. This will be addressed within guidance to standard 6.1 and by revision of the NCM Modelling Guide for Scotland.

The less demanding fabric specification for heated only buildings compared to heated and cooled buildings, differences in specification and a note that mechanical ventilation solutions may be equally appropriate and sustainable as natural ones in particular situations will be provided in published guidance.
5.3.3 Question 12 - Standard 6.1 – use of low carbon equipment element within target setting

“As part of the notional building specification Low Carbon Equipment (LCE) has been included. The notional buildings provide a base level of carbon dioxide emission savings, over which additional reduction is achieved by adding photovoltaic panels (PVs). The rationale for using PVs as a proxy for LCE in the notional buildings is that they are considered to be the most suitable technology for all building types.

This approach ensures that the notional buildings represent a practical and technically achievable solution in most cases. Designers can use different types of LCE or no LCE in order to achieve compliance with standard 6.1, however they will need to improve the performance of the building in other ways.

The proposed quantity of PVs was calculated as a percentage of the total building floor area and this was also constrained to 50% of the available roof area so that the contribution toward the aggregated total carbon dioxide emissions savings is achievable in practice.

Do consultees agree with the proposed floor area percentage of PVs included in the notional buildings specification under standard 6.1?

If not, please provide details of the concerns you have.”

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There are 55 responses to Question 12 of the consultation. 40 responses (73%) were positive, there were 7 (13%) negative responses and the remaining 8 responses (14%) did not indicate agreement or disagreement with the proposal.

Main themes

Photovoltaic panels as default choice
There were a few responses which indicated support for renewable technologies to be included in the target setting calculation, however concern was expressed that PV installations may become the default choice in the specification for new buildings, rather than a proxy for LCE in the compliance calculation.

It was suggested that designers need to be made aware that alternative renewable technologies, which may be better suited or more cost effective for certain projects, are available and acceptable within the regulations and energy compliance calculation.

One respondent noted that there are other PV options available which do not require roof space to be installed (e.g. transparent arrays used instead of glazing) and also noted that it is possible to install PV arrays at ground level. On the other hand, one respondent noted that 6.1.5 in the Non-domestic guidance designers are encouraged to utilise photovoltaic panels or other LCE.

Roof area limitation
The 50% roof area limitation which was used to define the percentage of renewables as part of target setting was not understood by some of the respondents. Even though there is no proposal to prescribe the inclusion of LCE in the technical guidance or a certain area limitation for LCE for new buildings, there were suggestions to remove the area limitation for PV installations as:

- it is onerous for larger buildings;
- it is not sensitive to the location of the buildings;
- depending on the building, more than 50% of the roof area could be used; and
- there may not always be sufficient roof area with the correct orientation to incorporate more than 4.5% of floor area with PV.

Metrics
Some respondents thought it would be useful to indicate the % contribution to the CO₂ reduction target that the 4.5% of Photovoltaic Panels would achieve. Others thought that other types of LCE would be encouraged if such an indicator was included in the technical guidance in some form as this may help designers focus on reducing the primary energy use in new buildings.

No LCE option
One respondent suggested that the CO₂ emissions target for different fuel types should be set in such a way that it could not be met without some form of LCE, or by improving either the maximum heating requirement and minimum building services efficiencies or both of these elements. This would give designers flexibility in their approach to fuel selection, fabric/services design and the use of LCE. One respondent expressed concern for rural, off-grid properties where the energy required for heating may not be offset by the energy generated by the PVs.
Photovoltaic panel performance
One respondent disagreed with this proposal and commented that PV panels are less efficient than rooflights in relation to lighting provision and, currently, there is no efficient way of storing the electricity generated for later use.

Other comments, not directly related to question 12, noted that:
- the potential impact on PV costs and FIT tariffs by tax being imposed on foreign products by the EU. Two more commented on the payback periods.
- the environmental impact of PVs and the need for research on the whole life impact associated with PV panels.
- the proposed changes favour renewable electricity but do not provide incentives for implementing low carbon heating techniques as the notional building uses the same heating fuel as the actual.
- a series of suggestions in relation to how the technical guidance should approach the NCM, ACDs, use of the non-domestic methodology for domestic stand-alone buildings over 50 m² and actual energy performance of the building when compared to calculated performance.

Commentary
- A 50% roof area limitation was used in research when defining the floor area percentage of PVs for target setting only and as such it is not considered here.
- The energy reduction contribution of the LCE towards the overall target is already available in the Technical Data Sheet which is produced when using the CO₂ emissions calculation tool. The carbon dioxide reduction contribution of LCE can be investigated for inclusion in the output of the compliance calculation documentation.

Question 12 - Standard 6.1 – use of low carbon equipment element within target setting
Scottish Government Response
We support inclusion of photovoltaic panels in the target setting calculation as a proxy for renewable technologies. This role will be highlighted in guidance, with emphasis on use in target setting only. Final guidance will maintain the component as proposed in the consultation (4.5% of floor area) but with a reduced maximum percentage of roof area.

As with domestic guidance, this is to recognise that the practicality of assigning a proportion of roof space to renewables decreases as the number of storeys increases under the proposed methodology. The contribution assigned within target setting will not exceed 30% of the roof area of the building.

5.3.4 Question 13 - Standard 6.1 – credit for use of automatic monitoring and targeting
“Automatic monitoring and targeting (AMT) is assumed to result in a 5% reduction in carbon dioxide emissions for the building services (HVAC and lighting) to which the AMT is installed. A credit of 5% is assumed elsewhere in
the UK as part of the NCM, however this credit is not assumed in the Scottish calculation.

For these savings to be achieved though, AMT needs to be installed and commissioned properly and the necessary improvements need to be made following on from the AMT outputs, by persons who have the authority and responsibility to take action.

Do consultees support the introduction of credits when automatic monitoring and targeting (AMT) is installed in a building under standard 6.1?

Please provide commentary in support of your view.”

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There are 44 responses to Question 13 of the consultation. 36 responses (82%) were positive, there were 3 (7%) negative responses and the remaining 5 responses (11%) did not indicate agreement or disagreement with the proposal.

Main themes

Comparison with England & Wales

There was generally agreement to include credits for the installation of automatic monitoring and targeting equipment in the compliance calculation for new non-domestic buildings. A few respondents noted that this approach seems reasonable and would improve standardisation with other parts of the UK. One of the respondents who agreed with the proposal also noted that aligning the approach to
credits for AMT may result in commercial benefits to equipment manufacturers here.

**Improving building operation**

Some of the respondents thought that credits should be given to encourage the installation of the monitoring equipment as this will improve the building operation and understanding of energy use. ‘Ticking’ a couple of boxes in the software, as is the case elsewhere in the UK, should not be the approach in Scotland.

They noted that certain conditions should be required to be met for the credits to be available, such as minimum elemental requirements and processes linked to the written information provided to the building users. There was also one respondent who commented that the actual benefit of using AMT is closer to 10%, rather than the proposed 5% in relation to the CO\(_2\) emissions reduction.

**Checking**

Some respondents thought that in principle the proposed change appears to be a sensible approach but it will probably not work and stressed as a condition for their agreement, that the system be installed, commissioned, signed off and handed over by competent persons.

Further to the above, one of the respondents asked if equipment and installers will be checked - whether equipment is fit for the intended purpose, correctly installed and if the maintenance schedules will ensure that the carbon savings are being achieved and verified independently. On this matter a few of the verifiers noted that compliance will be difficult to check as an AMT system will be in operation post-completion. One respondent noted that a “continuing requirement’ can be used as a way to ensure future building users are aware of the system and the requirement to maintain it.

**Disagreement**

Of those who disagree with the proposed change, one respondent noted the Carbon Trust statement that “AMT equipment and systems do not in themselves save energy, they simply enable users to pinpoint waste and save energy from the resulting remedial action”. It was also noted that the introduction of credits for AMT is not mentioned in Part 3 Technical proposals of the consultation package.

Another respondent disagreed with the proposal as using AMT is generally adopted only in larger non-domestic developments where there is an expectation by the client and designer to showcase the environmental credentials of the building. They noted however that AMT should be encouraged and included in supplementary guidance, e.g. the NCM Guide.

Other comments, not directly related to question 13, noted that:

- Automatic monitoring and targeting could encourage building users to change how they use the building in order to reduce energy use and as such the energy meter or some means of viewing the current energy use figure should be located in a public place, be easily visible and be easy to understand.
- Further guidance is required in the regulatory compliance documents as to the exact definition/specification of an AMT system, e.g. does automatic monitoring and targeting require BMS control that provides a specific output as a minimum.
Commentary

- This question was seeking comment on the inclusion of AMT credits as part of the carbon dioxide emissions calculation. Comments on behavioural change required to support use are noted in this context.
- Suggest credits should be given to encourage the installation of monitoring equipment as this has the potential to improve the building operation and understanding of energy use.
- Further information on installation, commissioning and regular maintenance of AMT systems should form part of the guidance in the Technical Handbook.
- Suggest the skills and competence of AMT installers as well as result verification and reporting can be considered as part of future review. This would allow time for the industry to grow and building owners/users to become more familiar with the technology.

Question 13 - Standard 6.1 – credit for use of automatic monitoring and targeting

Scottish Government Response

We consider that it is appropriate to introduce credits for the inclusion of monitoring and targeting equipment.

Commentary will be provided to remind building occupiers of the need for such equipment to operate as intended and to be maintained to optimise performance benefits.

5.3.5 Question 14 - Standard 6.2 – Improvement to U-values

“The backstop values which are proposed under standard 6.2 for the thermal performance of the building elements are maintained at their 2010 levels. This is to recognise existing good practice and also to allow designers the flexibility to adjust the performance of building elements based on the thermal profile of the building. These backstop values ensure the level of thermal performance of new buildings is based on a robust fabric specification without over-reliance on the performance of the fixed building services or renewable technologies, while recognising that in some instances (i.e. buildings with a significant cooling load) improving the U-values can be counter-productive.

Do consultees agree with the proposed backstop values for fabric for the three building groups under standard 6.2?

Comments are invited for any aspects of the specifications”.

38
There are 118 responses to Question 14 of the consultation. 35 responses (70%) were positive, there were 11 (22%) negative responses and the remaining 4 responses (8%) did not indicate agreement or disagreement with the proposal.

**Main themes**

Of the specific questions posed in relation to proposals for the non-domestic guidance, this received most negative responses (11 in total).

**Flexibility**

Respondents recognised that maintaining the backstop U-values to the 2010 levels allows designers flexibility in deciding how to comply with the requirements of Section 6. It was also noted that building services technologies should be further developed to ‘provide a more holistic solution’ for new buildings.

**Improve backstop values**

Amongst those who agree with the proposal there is a common view that lowering (improving) the current backstop values would put a further financial burden on developers during the current difficult economic climate. One manufacturer noted that often small incremental improvements in insulation values are not possible and bigger step changes may have unwelcome consequences. It was also suggested that no changes be implemented until 2019.
Costs
Those who disagree with the proposal noted that lowering the backstop levels is the most cost effective way of reducing energy demand for heating and air-conditioning and not doing so in 2014 would be a missed opportunity in delivering towards the Scottish Climate Change aspirations and the Sullivan report recommendations.

Considering and reducing energy demand prior to focusing on efficient plant and introduction of LCE was suggested to be fundamental. Non-domestic buildings tend to be subject to change of use over their lifetime and hence a higher fabric standard may be of benefit. Furthermore, current design practices already achieve “better than 2010” levels of U-values and improving on them can be easily done.

Alternative suggestions
The respondents who do not agree with this proposal suggested as follows:
- area-weighted backstops be further improved. Particular reference to tapered roofing insulation products where preventing interstitial, surface condensation and mould growth is essential.
- set backstop values as per the Domestic technical guidance and suggested that the guidance on thermal bridging be upgraded and air-permeability set at 5 m³/h.m² at 50Pa.
- suggest less demanding U-value backstop for buildings with a significant cooling load where the cooling load exceeds the heating load and reducing the maximum g-value for glazing to restrict solar gain.
- improving the backstop U-values in line with the improvement of U-values in the notional building; raised by a few respondents.
- the backstop U-values need ‘to catch up and ideally be better than’ those elsewhere in the UK.

Other suggestions
Of those who agree with the proposed approach to the backstop U-values, there were a few suggestions that were repeated verbatim by different respondents, however they were not directly related to the consultation question:
- heat loss for cavity party walls should be set at zero;
- correct installation is essential and government should develop a robust framework for collecting data on as-built performance to inform development of future revisions of the regulations;
- backstop U-values for new buildings, shell buildings, conversions of heated buildings and extensions to the insulation envelope should be consistent.

Other comments, not directly related to question 14, noted that:
- backstop U-value for rooflights should be 2.2 W/m2K assessed in the horizontal plane as that is how the majority of rooflights are installed, and how EN product standards define that U-values should be assessed for some rooflight types.
- internal air quality was mentioned as an area that needs to be taken into account amongst the energy performance measures (however given the context, we assume the respondents meant the air-permeability levels).
- concerns were noted regarding the proposed 3 building types and the variable U-values, air-permeability, etc. and for multi-zone buildings disagreement with having different values for different zones.
• There is concern that modular and portable buildings may be disadvantaged when compared to traditional construction.

**Commentary**

- Suggest that aligning the backstop U-values (if practical) for new buildings, shell buildings, conversions of heated buildings and extensions to the insulation envelope be considered further for future review of the Energy standards.
- We would note that retained current maximum area weighted U-values for fabric will still result in minimum performance levels more challenging than elsewhere in the UK, post-2014.

**Question 14 - Standard 6.2 – Improvement to U-values**

**Scottish Government Response**

We consider that the backstop U-values should, as proposed, be maintained at the 2010 levels.
However, we note the interest in further improvement in fabric performance as relevant to future review.

**5.3.6 Question 15 - Standard 6.2 – Display Glazing**

“Under the 2010 guidance display glazing is neutral in the carbon dioxide calculation: if present in the actual building, it is also included in the notional building. This approach is modified in the proposed guidance for 2013: display glazing is ignored in the notional building. This means that when display glazing is present in the actual building the calculated heat loss or gain through the display glazing will need to be compensated for elsewhere in the building to achieve compliance with standard 6.1.

Do consultees agree with the proposal to compensate for any heat loss or gain through display glazing elsewhere in the building?

If not, please provide details of the concerns you have.”
There are 42 responses to Question 15 of the consultation. 38 responses (90%) were positive, there were no negative responses and the remaining 4 responses (10%) did not indicate agreement or disagreement with the proposal.

**Main themes**

**Consistency**
This is the only question in relation to the proposals for the Non-Domestic guidance where there were no negative responses. The respondents thought that this would be a consistent approach to how the building envelope is treated, especially since in some buildings display glazing forms a significant part of the envelope. A few of the respondents thought that the way display glazing has been treated in the building regulations until now contradicts a drive to reduce emissions and energy use.

**Design flexibility**
Some respondents thought that this proposal may limit design flexibility, as the size and structural performance of display glazing need to be taken into account when looking to improve its energy performance. It is suggested that there should be a backstop U-value and g-value for display windows and one respondent proposed introducing a maximum area of display glazing. It was also noted that while this proposal could result in additional capital cost, the running costs should be considerably reduced over the life of the building. One respondent considered that a greater challenge to this element would promote innovation within the glazing industry.
Commentary

- Suggest that backstop values for display glazing and area limitations be investigated as part of future review of the energy standards.

Question 15 - Standard 6.2 – Display Glazing

Scottish Government Response

We consider that it remains appropriate to compensate for any heat loss or gain through display glazing where this forms part of the specification of a new building.

5.3.7 Question 16 - Standard 6.2 – Curtain Walling

"Under the 2010 guidance the translucent and transparent areas in curtain walling are assessed as glazing and the opaque areas as walls. It has been suggested that the calculation methodology could be simplified by assigning a backstop U-value to curtain walling.

Do consultees agree with the proposal to assign a backstop U-value to curtain walling? If so, consultees are encouraged to indicate an appropriate backstop value."

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There are 46 responses to Question 16 of the consultation. 35 responses (76%) were positive, there were 7 (15%) negative responses and the remaining 4 responses (9%) did not indicate agreement or disagreement with the proposal.

**Main themes**

**Different views**
There was generally agreement for this proposal, with a few suggestions for the U-value of curtain walling. It is worth noting that amongst those who agree with the proposal there are two views: one which supports introducing one backstop U-value for curtain walling and another which favours two backstop U-values, one for the glazed and one for the opaque parts of curtain walling. There are also respondents who agreed with the proposal, however did not propose a backstop U-value.

**One backstop U-value**
Of those who think one backstop U-value should be introduced, one respondent noted that curtain walling construction is different to a traditional wall/glazing construction and merits a distinct backstop U-value. Another respondent highlighted the fact that there is significant heat loss through mullions / transoms despite the use of infill panels and noted that there should be a way of quantifying the different percentages of glazed and opaque areas within the curtain walling element to arrive at a single backstop U-value. Area weighting was suggested by a few respondents as the appropriate way to calculate the U-value for curtain walling and the methodology in the ADL2A guidance was used as an example (possible reference to clause 4.31 of ADL2A 2010).

Some recommended that the U-value should be the same as that used for windows, doors and rooflights i.e. 2.0 W/m²K, whereas another respondent thought manufacturers should provide an average U-value based on glass specification/section size/section centres. One manufacturer suggested that 1.6 W/m²K is suitable, having been achieved in practice. Most of the suggestions for one U-value are in the region of 1.2 - 1.8 W/m²K. There were also suggestions for the backstop to be set as per the wall backstop, i.e. 0.27 W/m²K or better.

**Two backstop U-values suggestions**
Those who suggested two backstop U-values be introduced thought that it is appropriate to align the figures for translucent/ transparent and opaque areas with windows and walls respectively (i.e. 2.0 W/m²K for glazing and 0.27 W/m²K for walls), which are the same U-values used in the current (2010) technical guidance.

**No backstop U-value suggestion**
The comments which did not offer U-value suggestions included a recommendation that the U-value be obtained by the curtain walling industry, that Scottish Government should provide a suitable U-value after research and that the U-value needs to be specific to the type of curtain walling installed. One respondent agreed with the proposal on the provision that a standard assessment element or module configuration can be devised, while another agreed with the proposal if implemented in 2019.
Disagreement
Of those who disagree with the proposal a common argument was that ‘a backstop U-value for curtain walling as a whole would likely just confuse the issue rather than making it easier’, however there was no further commentary to explain why such an approach would be confusing. Another common comment was that ‘there is a backstop already there for walling generally irrespective of its construction. If a designer chooses curtain walling then other compensatory features are required’. Again, no additional information was provided.

Variables
One respondent commented that there are considerable variables in the percentage of opaque to transparent areas in curtain walling systems which would make a backstop unrepresentative. In a similar vein another respondent noted that ‘specifying a U-value that applies fairly to both translucent and transparent elements is not possible’. One respondent noted that orientation needs to be taken into account as well. An area weighted value provided by the curtain walling system manufacturers was suggested by others and such an approach is thought to have the potential to create innovation, without restricting the designs.

One industry association welcomed additional dialogue on this question.

Commentary
- On assigning a backstop U-value to curtain walling we recognise that there was no definitive answer given on the approach to U-values. It should be noted that the ADL2A (2010) has the same backstop U-value for curtain walling as for windows and rooflights.
- The methodology in the ADL2A guidance which was mentioned would allude to the guidance set out in BR443.

Question 16 - Standard 6.2 – Curtain Walling
Scottish Government Response
The current approach of two U-values remains fit for purpose. However we will provide further guidance on calculating the U-value for curtain walling within the revised Non-domestic Technical Handbook.

5.3.8 Question 17 - Standard 6.2 – Alternative approach to target setting for large extensions
“Extensions to the insulation envelope currently are not required to be assessed under standard 6.1. However this is an option if both the existing building and the extension are built to the same edition of the standards, or the extension can be assessed in isolation from the existing building. Under the 2010 guidance for extensions to the insulation envelope the backstop U-values for the building elements are tougher than those for new buildings. It is proposed to change the current approach to extensions to the insulation envelope and require all new large extensions to comply with standard 6.1. For the purposes of the proposed guidance a large extension is defined as an extension of 25% or more of the total floor area of the existing building.”
Do consultees agree with the proposed approach for large extensions?
If not, please provide details of the concerns you have."

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There are 49 responses to Question 17 of the consultation. 40 responses (82%) were positive, there were 5 (10%) negative responses and the remaining 4 responses (8%) did not indicate agreement or disagreement with the proposal.

### Main themes

**Standard 6.1**
Most of the respondents who answered this question agree with the proposal. Some of them recognised that limitation (a) of the mandatory standard would need to be amended if this proposal is taken forward. Guidance to standard 6.1 should also refer to this requirement.

**Minimum floor area limit**
Of those who agree with the proposal some suggested that there should be a minimum area threshold for the proposal to apply, as in its current form it would affect smaller buildings disproportionally. The suggestions for the extension minimum floor area were 50 m², 100 m² (which would align with the current ADL2A) and 125 m². It was also suggested to increase the area percentage to 50% or greater rather than the proposed 25%.
Other proposed requirements
There were further comments by those who agree with the proposal. One respondent suggested as a condition for this approach to large extensions to apply, that the existing building has also been assessed under standard 6.1, while another proposed to have a compensatory approach so that the extension can have poorer U-values if the existing building is improved at the same time. A few respondents noted that extensions under 25% of total floor area of the existing building should not be subject to lower requirements.

One respondent thinks that as well as a percentage of the existing floor area, perhaps an allowance could be made for extensions not exceeding a predetermined area or volume and also noted that very large buildings could have substantial extensions added and avoid the implications of standard 6.1, so a predetermined size could be considered over which 6.1 must apply no matter its proportion of the existing building.

Alternative suggestions
There are a few respondents who disagree with this proposal and believe that all extensions should be treated as new buildings. Some also noted that there should not be a requirement for better U-values for extensions at all when compared to new buildings, while one respondent suggested that there should be either a minimum floor area before standard 6.1 applies, or a more onerous requirement under standard 6.2 which would leave the designer/owner decide on the most suitable route to comply.

One respondent noted that this proposal would be impractical for extensions which tie into existing HVAC systems due to the costs involved and commented that current standards 6.2 - 6.10 and annexes 6.F and 6.G cover extensions in an appropriate manner.

One respondent thought that a Green Deal assessment should be undertaken and be used to demonstrate that improvements have been made to the existing building to offset the energy use impact of the extension. One respondent suggested deferring this proposal to 2019 in line with European targets as the extension market has already been badly hit by the recession with significant implications for the future.

Commentary
- As this question was seeking comment on the way large extensions are treated under building standards, other measures which could affect extensions are not considered here.
- Concerns over treatment of smaller extensions or extensions to buildings with smaller floor areas are noted. The floor area of the existing building which is being extended as well as of the extension need to be considered before a threshold for application is applied.
- We note that, for consistency, the criteria applied to trigger this requirement should reflect those cited in building regulations elsewhere in the UK.
Question 17 - Standard 6.2 – Alternative approach to target setting for large extensions
Scottish Government Response

We will amend mandatory standard 6.1 to apply to large extensions where the extension is both over 100 m² and more than a quarter of the size of the existing building. This will align with the rest of the UK.

5.3.9 Question 18 - Standards 6.3 to 6.6 Non-domestic – specification of equipment efficiencies and controls.

“Previously, recommendations on efficiency and controls for building services in guidance to standards 6.3 to 6.6 reproduce information developed for the Non-domestic Building Services Compliance Guide which support building regulations in England, Wales and Northern Ireland. Recommendations prepared by the Department of Communities and Local Government (DCLG) follow discussion and development with UK industry. The proposal is to directly reference this guidance document within the Technical Handbooks, retaining existing guidance only where not addressed in that document or where guidance specific to Scotland is required.

Do consultees agree that the Non-domestic Building Services Compliance Guide should form the guidance for compliance with standards 6.3 to 6.6? If not, please provide details of the concerns you have.”

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There are 50 responses to Question 18 of the consultation. 42 responses (84%) were positive, there were 3 (6%) negative responses and the remaining 5 responses (10%) did not indicate agreement or disagreement with the proposal.

**Main themes**

**Consistency of approach**
Generally respondents are in favour of this proposal as it will lead to similar building services specifications for non-domestic buildings throughout the UK. This would also remove any variations in guidance given by verifiers. In relation to the building warrant process, two respondents noted that sufficient detail and relevant information must still be shown on warrant applications rather than a simple reference to the Non-Domestic Building Services Compliance Guide being made.

**Scottish aspect**
A few of those who agree with the proposal insisted that the Building Services Compliance Guide should remain freely available and it should maintain currency with the guidance in the Technical Handbook. One respondent suggested that a Scottish version of the Building Services Compliance Guide would be welcome.

**Concerns**
Two respondents thought that a more sophisticated approach for complex buildings that includes better design for the routing of services is required. Amongst those who disagree with the proposed change some voiced concern about the capability of smaller contractors/developers who use ‘rules of thumb’ to specify systems to understand the Building Services Compliance Guide.

They thought that guidance needs to be simple, easy to understand and ideally located in a single document, as is the case currently with guidance to standards 6.3 to 6.6. By introducing the Building Services Compliance Guide as the only point of reference smaller companies may be disadvantaged on cost grounds by having to employ a specialist sub-contractor to assist in specifying services.

Other comments, not directly related to question 18, noted that:
- There is other guidance available for complex buildings and systems. In some cases significant improvements within services at a reasonable cost can be made through simplistic solutions. Improvement in service route design like pipework, etc should be rewarded within the regulations.
- The Notional Building values should be displayed so that designers who may not be involved with the simulation work can be made aware of the figures.
- Credit should be given to those designs that use natural daylight as all spaces should have natural light.

**Commentary**
- It is noted that sufficient detail and relevant information must still be shown on warrant applications.
- On concerns on the capability of smaller contractors/developers to understand the Non-Domestic Building Services Compliance Guide, current guidance (2010) to standards 6.3-6.6 is already largely aligned with the Non-Domestic Building Services Compliance Guide so change is primarily in presentation.
• Under current proposal smaller contractors/developers will need to refer to a separate document which does, however, provide the same or a greater level of information and detail as the 2010 Technical Handbook. It is generally viewed that the compliance guide format is more useful as it gathers information related to each type of services element together in one section.

**Question 18 - Standards 6.3 to 6.6 Non-domestic – specification of equipment efficiencies and controls.**

**Scottish Government Response**

It has now been established that, to meet regulatory conventions, a single UK guide will not be possible. Instead, a core UK text will be adopted by each administration and tailored as necessary to suit each regulatory framework and references.

A Scottish edition of the Non-domestic Building Services Compliance Guide will be published as part of the guidance on compliance with standards 6.3 to 6.6.

**5.3.10 Question 19 - Standards 6.3 - 6.6 - specific fan power.**

“The proposed guidance for 2013 in relation to fixed building services is given in the [Non Domestic Building Services Compliance Guide](#) (NDBSCG) which is produced by the Department for Communities and Local Government. This is intended to allow standardisation of the specification and expected performance of fixed building services throughout the UK. This guidance applies to new and replacement systems.

Under the 2010 guidance the maximum permissible specific fan power for central mechanical ventilation including heating, cooling and heat recovery is 1.8 W/lt/sec both for new and existing buildings. The same maximum permissible specific fan power (1.8 W/lt/sec) applies for central mechanical ventilation including heating and cooling (without heat recovery) for new buildings and 2.2 W/lt/sec for existing buildings.

In the proposed version of NDBSCG for 2013 the maximum permissible specific fan power for central mechanical ventilation including heating and cooling is 1.8 W/lt/sec for new buildings and 2.2 W/lt/sec for existing buildings. When additional components, such as heat recovery, are included in the air distribution system, the maximum permissible specific fan power can be extended. By adopting the proposed approach for 2013, the 2010 guidance under standard 6.6 will be relaxed.

Do consultees agree with relaxing the maximum specific fan power in air distribution systems for new and existing buildings?

If not, please provide details of the concerns you have.”
There are 37 responses to Question 19 of the consultation. 30 responses (81%) were positive, there were 4 (11%) negative responses and the remaining 3 responses (8%) did not indicate agreement or disagreement with the proposal.

Main themes

This question received the least responses of the Non-domestic consultation questions.

Technical suggestions

Most of those who responded to the question agree with the proposed change as it would provide consistent guidance to developers who build across the country. One respondent noted that there should be additional guidance asking for energy savings equivalent to the anticipated energy increase of the fan installation. A few respondents noted that heat recovery should be the default option and one respondent thought that the specific fan power (SFP) levels ‘for “local” units have achieved their maximum efficiencies and little or no improvement in the regulations is required for these types of units’.

Disagreement

Those who disagreed with the proposal on the other hand thought that relaxing the current requirement may result in a potential loop-hole and it would give the wrong
message. One respondent recommended that the proposed specification could be
adopted as a backstop for SFP, as this approach will provide flexibility in the design
and rationalisation of specifications.

Other comments, not directly related to question 18, noted that:
• Variable speed fans should be considered with maybe a diversity figure applied for
  the inclusion of inverter drives.
• Increased fan power could potentially increase ambient noise level. The
  respondents who identified this matter thought that a requirement for attenuation
  or maximum ambient noise level in a room should be stipulated in guidance.

Commentary
• Relaxing the current requirement for SFP will allow the extension of SFP for
  additional items such as heat recovery systems, for which allowance is not
  currently made.

Question 18 - Standards 6.3 to 6.6 Non-domestic – specification of
  equipment efficiencies and controls.

Scottish Government Response
We will amend the maximum specific fan power in air distribution systems
  for new and existing buildings.

Mandating heat recovery and addressing ambient noise issues can be
  investigated as part of future review.
6. **Conclusions**

6.1 All responses received were collated and presented to the Energy Working Group who assisted in informing the decisions made with regard to proposals. Proposals will now be taken forward as outlined in the Scottish Government response sections of this document, to the range of issues discussed within the consultation.

6.2 The guidance given in the Technical Handbooks will be amended in line with the Scottish Government Responses in this document. Where the proposals relate to changes to the building regulations or their associated schedules, the process of making the necessary changes to the legislation will now be initiated.

6.3 The recommendations of the 2013 Update of the Sullivan Report is also relevant to the subject of this consultation. The report recommended action by government and industry in support of the 2015 standards. Following initial discussions with industry partners, this process and the development of a joint ‘Action Plan’ will take place from July 2014 onwards. Information on The Sullivan report and the Action Plan is available online at [www.scotland.gov.uk/sullivanreport](http://www.scotland.gov.uk/sullivanreport).

7. **Next Steps**

7.1 Following amendment of the technical detail of proposals, in line with the Scottish Government Response in this document, final standards and guidance will be submitted for Ministerial consideration. On approval, changes to regulations will be laid in the Scottish Parliament in August 2014, with the intention that revised Technical Handbooks will be published in October 2014.

7.2 As announced in September 2013, it is intended that the new standards and supporting guidance will come into force in October 2015.

7.3 Dissemination events will be organised by BSD to help deliver key messages:
- Delivering reduction in carbon dioxide emissions;
- Understanding the revised methodology for non-domestic buildings;
- Timing of changes and revised NCMs.
- Raising awareness of other published material and resources which will assist building owners, developers, designers and contractors in relation to the revised standards,

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7.4 Timetable for implementation:

July 2014 - Target setting specification confirmed for new buildings; begin Action Plan work.

August 2014 - Sign-off of final Business & Regulatory Impact Assessment; Lay SSI for amended regulations in Parliament

October 2014 - Publication of Technical Handbooks section 6 (energy) 2015 and supporting guidance; software tools supporting 2015 standards begin to become available.

December 2014 - Further supporting guidance; update report on Action Plan discussions & outputs

May 2015 - BSD Dissemination events begin.

October 2015 - Section 6 (energy 2015) in force; report on Action Plan discussions & outputs.

8. Contact

Building Standards Division
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Annex A: Executive Summary - analysis of consultation responses to Question 1

Note: the full consultation analysis of Question 1 is published online at: http://www.scotland.gov.uk/Resource/0045/00456701.pdf


QUESTION 1 Responses - Analysis by Liz Shiel Associates

Executive Summary

This report summarises the results of a consultation on new standards for energy in buildings carried out by the Scottish Government, and is part of the work being carried out to look at future improvements of the energy standards and guidance. The consultation process took place between 14 January 2013 and 15 April 2013.

Views were sought from key stakeholders in the built environment and related sectors on revised standards for low carbon buildings. This report covers the responses to Question 1; the analysis of the remaining questions is contained in a separate report.

Main Findings

- Research undertaken to inform the review of energy standards assessed the additional costs of meeting the proposed regulations. Contractors and industry representatives/manufacturers were typically concerned about how these additional costs could be funded, and the implications of cost increases on an already depressed development industry.

- Voluntary and social housing sector respondents recommended adopting higher environmental standards – in line with the 2007 Sullivan Panel recommendations. These would enable vulnerable occupants to benefit from the higher standards in terms of lower fuel bills and improved health outcomes; and would reduce the need for costly retrofitting at a later date.

- There were concerns that increased costs would impact on key sub-markets: reducing affordable housing output if subsidy were not increased; and disadvantaging firms in rural/remote areas because construction costs are higher in these areas.

- Many respondents, largely although not exclusively from the domestic sector, expressed a preference for fabric only/first solutions, which were regarded as durable and low risk. In comparison, some regarded reliance on on-site renewables to meet targets as placing a burden on home-owners, both in terms of using them effectively and maintaining/replacing them over the lifetime of the building.

- Several respondents stressed the importance of simplifying the standards and of developing standards that were consistent across the UK. It was considered this would improve compliance and reduce costs.

- A wide range of respondents identified the importance of effective compliance monitoring, to ensure the standards delivered carbon reductions in practice.
• Many of the respondents expressed concerns that the proposals were being progressed before the relevant version of SAP had been made available to the industry, and requested delaying the introduction of any new standards until at least six months after SAP software has been approved for use. Similar concerns were also expressed in relation to SBEM software for use with non-domestic buildings.

• There were also calls from contractors and industry representatives/manufacturers that the setting of the standards should be delayed until the reconvened Sullivan Panel has reported.

Background
In December 2012 the Minister for Local Government and Planning announced the consultation to look at improvements to make new Scottish buildings even more energy efficient. The consultation on Section 6: Energy is part of the work being undertaken to look at future improvements to energy standards and guidance.

The consultation proposed specific levels of further abatement up to and including the levels recommended in the Sullivan Report for the next energy standards. It also included proposals to change the way in which emissions targets are set for new non-domestic buildings and proposed reference to current UK guidance on the minimum performance of fixed building services.

The consultation document was in three parts: Section 1 contained one question which asked respondents to offer commentary on any aspect of the consultation proposals which was not addressed in the remaining sections of the consultation; Section 2 contained eight questions on technical matters relating to proposals on domestic properties and section 3 contained ten questions on technical matters relating to proposals on non-domestic properties.

This report is concerned only with responses relating to Section 1, Question 1, the general question. The other questions have been analysed by technical staff within Scottish Government and are being reported separately.

The response
In total, 117 valid responses were received to the consultation. There was a strong industry response, both from industry associations/manufacturers and from contractors. Responses were also received from half of Scottish local authorities and a number of key voluntary or environmental organisations. A noticeable gap was from the affordable housing sector: with the exception of the Scottish Federation of Housing Associations (SFHA), there were no responses from housing associations.

The comments from contractors and voluntary/environmental organisations largely relate to the domestic market. Respondents from the industry associations/manufacturers, designers and local authorities groups were more likely to address issues relating to both the domestic and non-domestic market or, in a small number of cases, to focus specifically on the non-domestic market only.

There were several group responses, that is, responses that were used in whole or in large part by more than one respondent. In particular, the Homes for Scotland (HFS) response was used or adopted by a further 21 respondents; six timber product
manufacturers used a broadly common submission; and six voluntary or environmental organisations used a core text within their responses.

**Costs**

It was appreciated that the new standards will generate additional costs without commensurate benefits from improvement in energy efficiency.

Many respondents had clear concerns as to how the new standards would be funded: they noted that consumers already seemed unwilling to pay for measures that do generate energy efficiency benefits, and that the housing market remains depressed with flat house prices restricting opportunities for costs to be absorbed through price inflation. Key concerns were that increased costs would shrink developer margins, further reduce housing output, increase job losses in the housing sector, threaten the viability of some small and medium size firms, and reduce the future viability of some sites. Some respondents concluded that the additional costs and risks to the house building industry of moving to the higher standards at this time do not justify the benefits gained.

There were also clear concerns from a number of respondents with an interest in the non-domestic sector that rising costs could present an issue for the commercial sector. There was a view from SFHA, voluntary/environmental organisations and a number of manufacturers, that the original Sullivan recommendations for 2013 should be retained. It was suggested that the proposed approach of building to a lower standard with potential subsequent retrofit could be more expensive in the long run than simply adopting the higher standard now. A range of other benefits associated with adopting the higher standards were highlighted: for example lower fuel bills and reduced levels of fuel poverty, and reductions in health-related problems, leading to reduced demand for NHS services and increases in economic productivity. Respondents also noted that the viability of firms that had developed investment strategies based on the 2007 Sullivan Report recommendations could be threatened if the revised proposals were taken forward.

**Sub-market issues**

There were concerns that increased costs would impact on key sub-markets. First, respondents were concerned that higher costs associated with the proposed energy standards would place further pressures on the delivery of affordable housing, especially given recent declines in affordable housing subsidies. And second, it was suggested that firms in rural and remote areas would be at a disadvantage as build costs are relatively higher and the impacts of the housing recession are more severe in these areas.

**Fabric only/fabric first**

There was support for fabric only/first solutions among respondents, particularly within the industry representative/manufacturers group (largely from the domestic sector, but also some covering both sectors): as these solutions are seen as being durable, having no customer impact and low risk. However, there were some concerns that compliance with targets was likely to be achieved by installing on-site renewables – especially photovoltaics. Respondents commented that these solutions require on-
going maintenance and replacement throughout the life of the building, transfer cost/risk onto the home owner and will perform poorly if not properly maintained.

**Consistency of standards across the UK**

Several respondents, typically industry representatives/manufacturers and contractors, stressed the importance of developing standards that were consistent across the UK. Respondents commented that because developers and manufacturers work across the country, separate regulations increase complexity and costs. It was commented that the English authorities have recognised the problems caused by regulatory burdens, and have implemented a ‘one in, two out’ approach, which could make England a more attractive place to invest\(^8\). It was suggested that firms would find it increasingly difficult to invest in Scotland.

**Simplified standards**

Following from this, a wide range of respondents commented that the standards would benefit from being made simpler and changed less frequently. It was suggested that they are currently too wordy and complex. Indeed, the local authority representative organisation (Local Authority Building Standards Scotland) suggested that Section 6 be “completely overhauled” to ensure that compliance processes do not become too complicated and time-consuming.

**Compliance**

A wide range of respondents mentioned the importance of effective compliance monitoring. Respondents were concerned about the performance gap, between “as designed” and “as built”, resulting from factors such as poor quality materials and installation. Respondents also raised wider concerns about measuring the performance of buildings as lived in – and suggested there could be a role for approaches such as field trials, post occupancy evaluations and thermal imaging to assess the on-going impact of measures installed.

**Timing**

Several respondents, principally house builders, some manufacturers and their representative bodies, suggested delaying setting new standards until after the reconvened Sullivan Panel has had an opportunity to review the implications of the current economic climate on the industry’s capacity to deliver the staged climate change targets.

**Alternative to new standards**

There was support among house builders for Homes for Scotland’s Retrofit Reward Scheme, which would give house builders who do not wish to work to the new standards the option of continuing to deliver to the 2010 standards and making a financial contribution to be used for the retrofitting of existing homes.

Consumer preferences/behaviour

A number of respondents commented on consumer preferences and behaviour, given the lifestyle changes that living in a highly efficient building and the use of on-site renewables can require.

Some respondents - typically industry associations and manufacturers supportive of fabric first approaches - commented that home owners living in houses with on-site renewables find them complex and difficult to operate; and that the burden of maintaining and operating the systems was considered onerous by some.

Some respondents, typically house builders and their representative organisations noted the comments from the 2007 Sullivan Report on the lifestyle changes that people had to adopt to effectively live in a highly efficient home, and suggested consumers need to be given the choice about living in such a home.

Availability of SAP 2012/SBEM

Many of the respondents (contractors and manufacturers/industry representatives) expressed concerns that the proposals were being progressed before the relevant version of SAP had been made available to the industry.

Respondents commented that the appropriate version of SAP was needed to enable investment planning and product development planning; and requested delaying the introduction of any new standards until at least six months after SAP software has been approved for use.

There was also a call from the commercial sector to provide time to enable the sector bed-in the SBEM compliance tool.

Design flexibility

Respondents were generally supportive that the proposals promote design flexibility.

However, a small number commented that greater clarity on the extent of design flexibility would be helpful: for example, the target setting specification should be used only to set targets and should not favour any of the measures or solutions listed.

Consequential improvements

A number of respondents – typically voluntary/environmental organisations – commented that they would have preferred the consultation to have included proposals to extend the scope of consequential improvements introduced in 2010.

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*SAP: Standard Assessment Procedure, SBEM: Simplified Building Energy Model*
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