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# Summary of responses to the consultation entitled 'Improving the energy performance of air conditioning products'

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# 1 Introduction

1. On 5 December 2007, following the publication of the Energy White Paper, the Government launched an air conditioning systems consultation paper<sup>1</sup>. Interested parties were invited to provide comments by the end of February 2008. AEA Energy and Environment managed this consultation, as lead contractor of the Government's Market Transformation Programme (MTP).

2. The paper (chapter 6 of the consultation paper) set out the Government's current evidence, analysis, indicative targets and eco-design standards for air conditioning systems that are sold and brought into use in the UK. The consultation paper was directly circulated to over 350 organisations and individuals. In addition, it was published on the MTP website and open to all interested parties for comment. This consultation is part of a wider annual review and policy development process, supporting delivery of the Government's objectives for energy and for sustainable consumption and production.

3. The responses have been reviewed and are reported in the following sections:

- Section 2 summarises the quantity and nature of responses received.
- Section 3 gives a summary of the responses by consultation question and the Government's response.
- Section 4 details the next steps in the process.

4. Appendix 1 lists the stakeholders who provided a response.

# 2 Overview of responses

5. Four responses were received. Three stakeholders (EST, Mitsubishi, Spaceair) provided detailed comments and suggestions in relation to most of the nine questions posed in the consultation document; a third participant (FETA) submitted one comment which was addressed under Question 1.

6. A range of factors were discussed in relation to market and technological trends. Whilst stakeholders noted that hotter summers would increase energy demand from use of air conditioning it was noted that cooler winters would also reduce energy consumption from units in heating mode. Certain trends identified in the consultation document were also questioned including for example the increasing demand for portable units. One stakeholder provided technical data supporting their view that residential air conditioning units are not required and called for the Government to review the need for such equipment. One respondent highlighted the large and increasing growth in demand for air conditioning from data centres and trading floors.

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<sup>1</sup> The original air conditioning systems consultation document (Sustainable Products Policy Brief, Energy in use: Air Conditioning Systems. Evidence, analysis, targets and indicative standards) can be downloaded at <http://www.mtprog.com/cms/whitepaper/>

7. In relation to the graphs and indicative performance standards, one participant suggested that an average EER rating B should be the target for the EBP and P1 projections for mini split conditioners by 2010 rather than an A rating, whilst a second participant suggested the standards for domestic-sized package units should be set higher.

8. Comments were received in relation to improving market analysis including for example the importance of gathering information on consumer procurement and usage of domestic air conditioning. In relation to supply chain measures, the scope for the voluntary removal of the worst performing air conditioning units was highlighted as well as the need for current performance standards to be addressed to achieve wider improvements. Encouraging the removal or replacement of old, inefficient systems, as well as frequent maintenance of existing systems, by educating users was also raised.

9. The need for mandatory minimum product standards was highlighted by one participant whilst two sets of comments addressed the role of the standards contained in Part L of the Building Regulations; one commenting that there was a need for them to be raised and another noting the need to differentiate between the carbon emissions impact of the different elements of an air conditioned building.

10. Additional measures identified included the need to acknowledge and reward air conditioning systems that as a combination of elements contribute to reduce carbon emissions and the need to consult industry on tools to educate the operator regarding energy efficiency. It was suggested that commercial and industrial use of air conditioning required the greatest focus in driving efforts to increase energy performance.

### 3 Summary of topics raised and the Government's response

**Question 1: Are there any other market or technological trends or factors that should be taken into account in this market overview?**

**Summary table for Question 1**

Key topics raised	Number of comments
Need to clarify aspects of the basis for the trends analysis	1
Cooler winters will reduce energy consumption from packaged systems in heating mode	1
Stated growth in demand for portable units questioned	1
No evidence to support the claim made in the document that the most energy efficient products are not generally marketed in the UK	1
Industry doubts concerning magnetic bearing chiller technology likely to limit significant market penetration in the short term.	1

High level of (growing) demand for air conditioning arising from data centres and trading floors should be addressed	1
Other comments	3

11. Three participants responded to this question and noted a wide range of trends and factors.

12. One participant commented that there was a need to clarify the basis for the analysis of trends, including for example whether the 2006 energy consumption for air conditioning (Figure 2.1 in the consultation document) is based on inverter on non-inverter technology and whether these data are based on lower energy efficiency ratio (EER) than currently used for either Eurovent or the Energy Technology List (ETL) and therefore open to misinterpretation.

13. In relation to the consultation document's projected increase in electricity consumption due to hotter summers, it was noted that the majority of the packaged system types referenced are installed as reverse cycle heat pumps and that the reduced energy consumption in heating mode should also be considered, given the trend towards cooler winters.

14. The document's stated growth in demand for portable units was considered to be highly questionable by one participant who noted that there had been a steep decline in demand observed in the market. It was noted that evidence of declining growth in sales of central plant can be confirmed by market statistics which show that packaged equipment has overtaken central plant sales. It was suggested that this trend is largely driven by the market's desire for an energy efficient packaged system able to satisfy both heating and cooling loads without the need to adopt secondary and relatively inefficient heating systems.

15. The same stakeholder also stressed that there is no evidence to support the claim made in the document that the most energy efficient products are not generally marketed in the UK. It was further noted that while magnetic bearing chillers offer claimed full and part load efficiency performance, the industry has doubts that this technology has been sufficiently proven to justify significant market penetration in the short term.

16. One respondent commented that for domestic usage the lack of market information acts as a barrier to defining suitable policies and interventions. It was also agreed by this stakeholder that increases in sales and usage of portable packaged units triggered by longer hot spells presented the major threat to energy reduction in the sector.

17. The high level of demand for air conditioning arising from data centres and trading floors was highlighted by one stakeholder. It was suggested that although this demand was comparable to (and forecast to grow at a faster rate than) energy loads from supermarkets, it was not apparently being addressed through Government action.

## Government response

18. Trend analysis of air conditioning energy consumption is based on the size of the stock and the in-use efficiency of individual air conditioning products and systems. Inevitably a large proportion of the existing stock of systems will be older technology and, for example, may not incorporate inverter technology. In-use efficiency may also be different to the values used for the Energy Technology List (ETL) which are based on steady-state full load test conditions. The Government recognises that developments, such as inverter technology, will raise the efficiency of many air conditioning products and systems. Future work will include further development and refinement of the stock models to include in-use operating factors so that the true benefit of inverter technology and other innovations can be accurately reflected.

19. New packaged air conditioning products are often reverse cycle systems and where these are used for space heating in winter they may result in energy savings compared to conventional heating systems. This energy is being modelled separately by the Government's MPT domestic and non-domestic heating sectors.

20. There is no evidence that air conditioning products on the market in the UK are generally less efficient than those available elsewhere. However, there is evidence that some single duct (moveable) air conditioners on sale in Japan have higher efficiencies than similar sized products available in the UK.

21. The Government recognises the increasing energy consumption of data centres. This issue is being addressed through the Government's MTP ICT Infrastructure Sector. The Market Transformation Programme is also contributing to the EU Code of Conduct for Data Centres with the aim of minimising energy use in data centres.

### **Question 2: Do the performance values shown in the tables in the Appendix cover the right air conditioning systems and are they set at the right levels?**

#### **Summary table for Question 2**

<b>Key topics raised</b>	<b>Number of comments</b>
An average EER rating B should be the target for the EBP and P1 projections for mini split conditioners by 2010	1
Proposed performance levels for domestic-size packaged units should be set higher	1

22. This question refers to the tables describing the indicative performance targets in the Appendix (see pages 37 to 39 in the original consultation document). Two stakeholders responded.

23. The first participant commented that because almost all mini split conditioners will be reverse cycle heat pumps by 2010, it is unrealistic to seek an EER of energy label A; it was suggested that an energy label A will likely be more desirable in heating mode as this will reflect a greater overall carbon emission reduction and that therefore an average EER rating B should be the target for the EBP and P1

projections (noting that reverse cycle heat pumps are always slightly more efficient in heating than cooling mode).

24. The second response commented that the proposed performance levels for domestic-size packaged units (<12 kW) show a lack of ambition and need to be set higher.

### Government response

25. The proposed P1 and EBP projections are for 50% of new packaged air conditioners to achieve energy label class A by 2010, and for all new products to achieve class A by 2015. This is considered to be an ambitious but achievable target. A small number of air conditioners, including reverse cycle models, already achieve these levels. However, it is accepted that to achieve these levels for all new products on the market may require significant incentives and possibly market intervention through minimum performance standards.

26. The Government is pushing for the scope of the EuP to be extended to cover larger air conditioning products and to set suitably ambitious minimum performance targets in order to achieve this.

### Question 3: In the areas of market analysis, projections and targets, should consideration be given to any additional measures, risks or strengthening initiatives?

#### Summary table for Question 3

Key topics raised	Number of comments
Support for gathering information on consumer procurement and usage of domestic air conditioning	1
Air conditioning systems are not required in residential dwellings.	1
EPBD should begin to determine whether measures in use compare to published data	1
Risk of failing to prevent the UK becoming a dumping ground for cheaper less efficient products	1
Risk of Government failing to incentive increased performance	1
Strengthening initiatives should include incentives and penalties.	1

27. Two participants provided comments in response to this question.

28. One participant expressed their strong support for gathering information on consumer procurement and usage of domestic air conditioning. One participant expressed the view, with supporting data, that mechanical air conditioning equipment is not needed for residential dwellings as free heat and cooling devices can be used to ensure comfortable living temperatures.

29. The second participant commented that the Energy Performance of Buildings Directive (EPBD) should begin to determine whether measures in use compare to published data, although it was noted that this implies a need for greater attention to system design and operator use and not equipment efficiency failings.



30. Identified risks included the failure to prevent the UK becoming a dumping ground for cheaper less efficient products and the failure of the Government to incentivise increased performance. It was noted that strengthening initiatives should also include use of incentives and penalties.

### Government response

31. Although levels of domestic air conditioning are thought to be very low this sector is considered to be at high risk of high levels of growth if the UK experiences an increased incidence of hot summers. The Government will gather more information on usage and consumer procurement of domestic air conditioning through the Market Transformation Programme.

32. The Government is reviewing the Building Regulations Part L carbon emission improvement factors for air conditioned buildings and the minimum air conditioning performance values in the guidance to Part L. These measures will provide stronger incentives to increase performance of products and systems, including in-use performance.

33. Scottish Government is reviewing the Building (Scotland) Regulations Section 6 which could require carbon emission improvement factors for air conditioned buildings and the minimum air conditioning performance values in the guidance to Section 6. These measures will provide stronger incentives to increase performance of products and systems, including in-use performance.

### Question 4: In the area of engaging the supply chain, should consideration be given to any additional measures, risks or strengthening initiatives?

#### Summary table for Question 4

Key topics raised	Number of comments
Scope for the voluntary removal of the worst performing air conditioning units	1
Current performance standards need to be addressed to achieve wider improvements	1
Current initiatives such as the ETL can act as barriers to the adoption/development of more energy efficient technologies unless they are more efficiently structured	1
Red/green calculator will not add value to existing initiatives	1

34. Three respondents provided comments relating to this question.

35. The first stakeholder commented that within Europe there was considerable scope for the voluntary removal of the worst performing air conditioning units. In terms of voluntary phase out initiatives, it was noted that the air conditioning sector was considerably behind other product sectors such as the white goods and brown good markets and that this needed to be tackled accordingly.

36. The second stakeholder commented that the current performance standards developed to maximise efficiency needed to be addressed to achieve wider improvements. It was noted that unless more efficiently structured, there was a risk that current initiatives such as the ETL can act (and have acted) as barriers to the

adoption/development of more energy efficient technologies. The view was also expressed that the industry is responding to a wealth of new standards and EC Directives the suggestion of a red/green calculator would not add any value to these existing initiatives.

37. One called for the adoption of best practice for installation and maintenance of air conditioning systems across the industry. They referred to programmes adopted by existing manufacturers in the sector who work in partnership with installers and maintenance operators.

### Government response

38. Government will ensure that ETL criteria are regularly reviewed so that they maximise the incentive for more efficient products. The Government will also push the EC to adopt ambitious EuP minimum performance standards to encourage removal of the worst performing products from the market.

**Question 5: In the area of EU and international policy actions, programmes and initiatives, should consideration be given to any additional measures, risks or strengthening initiatives?**

### Summary table for Question 5

Key topics raised	Number of comments
Inverter technology makes fixed step testing difficult	1
Impact of Energy Performance Certificates resulting from Energy Performance of Buildings Directive	1
Seasonal whole system performance evaluation is encouraged by industry	1
Mandatory minimum standards should be coupled with a re-valorisation exercise for the EU energy label and a tightening of the test value error bands	1

39. This question was answered by three participants. One stakeholder commented that there is currently wide industry acceptance of part load performance improvements and associated benefits such as extended life expectancy and reduced life cycle costs. However, it was stated that the nature of the inverter technology makes fixed step testing difficult. It was further noted that the principle of seasonal whole system performance evaluation is encouraged by industry.

40. On a similar issue, one stakeholder raised the issue of Energy Performance Certificates which are due to be introduced from 2009. They commented on the importance of upgrading existing (inefficient) air conditioning systems and the fact this can save significant amounts of CO<sub>2</sub>. They commented on the technical challenges of reusing existing pipe work when systems are upgraded, but consider these challenges can and should be overcome.

41. The second participant expressed the view that mandatory minimum standards are needed for domestic air conditioning products. It was suggested that from a UK- perspective, these should be set near to current best practice but that it was also appreciated that southern Member States have different air conditioning needs to the UK. It was suggested that this should be coupled with a re-valorisation exercise for the EU energy label, given the scope for performance well above

threshold for A-rating and that there should be an associated tightening of the test value error bands.

## Government response

42. The Government supports development of more appropriate performance test standards that properly address in-use, including part load and seasonal, operation and reduction of the existing permitted performance tolerances. This will also allow fairer testing of new technologies such as inverter technology.

**Question 6: In the area of UK policy actions, programmes and initiatives, should consideration be given to any additional measures, risks or strengthening initiatives?**

### Summary table for Question 6

Key topics raised	Number of comments
Building Regulations Part L need to differentiate between the carbon emissions impact of the different elements of an air conditioned building	1
Existing minimum standards Building Regulations are very weak and should be raised	1
Encourage greener products through Enhanced Capital Allowances	1
VAT on domestic air conditioning equipment should not be reduced	1
Importance of system design (impact on sustainability and efficiency)	1
Review need for domestic air conditioning	1

43. Comments were received from three stakeholders. Whilst noting that they had nothing to add to the measures and risks identified, one participant commented that Part L of the Building Regulations needed to differentiate between the carbon emissions impact of the different elements of an air conditioned building because 'air conditioning' comprises heat, cooling, ventilation and humidity control (which to date has proven to be impossible to design out of modern efficient buildings and in many cases has to be designed in). A second respondent also commented on the Building Regulations and expressed the view that the current minimum standards were very weak and should be raised.

44. It was noted by the respondent (EST) that domestic air conditioning units are specifically excluded from CERT because they are not an essential item for the vast majority of people. For this reason, it was pointed out that the EST does not currently intend to include domestic air conditioning units within ESR although these would be kept under review for the longer term. It was further stated that the EST would strongly oppose moves to reduce VAT on domestic air conditioning equipment.

45. The third stakeholder suggested that Enhanced Capital Allowances should be more widely encouraged to ensure only the greenest products are economically viable options. They also mentioned the importance of design standards and how they are integral to improving sustainability and efficiency. These standards should take into account efficiency for ventilating buildings including the variable control of ventilation systems. The design of control systems should assist users of air-conditioning systems in conjunction with the wider education of users. They urged the Government to review the need for residential air conditioning.

## Government response

46. The previous response given in paragraph 30 explains that current Building Regulation minimum performance standards are being reviewed. Part L of the Building Regulations has moved away from an elemental approach to a whole building emission rate value. This makes it inappropriate to discriminate between carbon emissions from different elements of an air conditioning system. The whole building approach also provides an incentive not to provide additional air conditioning functions such as humidification control as this is usually a highly energy intensive process.

47. Government has no plans to reduce VAT on domestic air conditioning equipment.

### Question 7: Are there any other policies likely to impact on air conditioning products that should be taken into account?

#### Summary table for Question 7

Key topics raised	Number of comments
Definition of products covered	1
Best practice for disposal of old equipment	1

48. Two stakeholders responded to this question. One noted that the UK already applies a reduced rate VAT for energy saving materials including heat pumps and that the consultation document needed to decide whether to discuss air conditioning in its correct definition or just mechanical cooling, which is just one element of air conditioning.

49. The other stakeholder suggested best practice for the disposal of old equipment should be set for the sector.

## Government response

50. The strict technical definition of air conditioning requires temperature and humidity control. However, in reality many 'air conditioning' systems only provide temperature control, and in some cases only a tempered air supply. It is therefore considered to be inappropriate to use the strict definition or to restrict the scope of the consultation.

51. Portable air conditioning appliances are covered by the Waste Electrical and Electronic Equipment Directive (in the large household appliances category). The Directive sets treatment requirements and targets for the recovery and recycling of components and materials, which are set at 80% for large household appliances. Defra produced, in 2006, Guidance on the Best Available Treatment, Recovery and Recycling Techniques which treatment and recycling facilities are expected to follow.

**Question 8: What additional measures would you suggest developing to drive forward sustainability in air conditioning equipment and systems?**

**Summary table for Question 8**

Key topics raised	Number of comments
Need to address commercial and industrial sectors	1
Education of users regarding impact of equipment age on efficiency.	1
Promotion of free cooling and need for maintenance	1
Acknowledge and reward air conditioning systems that as a combination of elements contribute to reduced carbon emissions	1
Consult industry on tools to educate the operator regarding energy efficiency	1

52. Comments from three stakeholders were received in response to this question.

53. One respondent simply commented that the major area which needed to be addressed was the commercial and industrial sectors. The second respondent suggested a need for the following measures:

- Acknowledge and reward air conditioning systems that as a combination of elements contribute to reduced carbon emissions compared to e.g. systems that incorporate conventional fossil fuel heating systems with higher carbon emissions.
- Consult industry on tools to educate the operator regarding energy efficiency etc as Government funded establishments have tended to be based advice on biased and out of date information.

54. The other respondent called for users to be educated about the efficiency of their air-conditioning system as it ages and an advised replacement date should be placed on all products at the time of sale and at any forthcoming maintenance. They also urged the Government to promote free cooling as well the importance of regular maintenance of equipment.

**Government response**

55. The consultation has focussed on commercial uses of air conditioning because the domestic sector is still very small and in relative terms will continue to be for some time to come. Industrial refrigeration is currently included under the Commercial Refrigeration Products consultation.

56. The Government recognises and accepts that air conditioning should be considered as a system comprising a number of components. In-use factors including operating training and guidance should therefore be important considerations for improving energy efficiency and Government is keen to work with industry on this.

**Question 9: Are there any other potential impacts resulting from these proposals that should be taken into account?**

57. Stakeholders did not respond to this question.

**General responses**

58. One stakeholder submitted some supporting general comments in relation to their submission. Their overriding message was that when it comes to cooling building environments 'Free Cooling & Heat Recovery' strategies are significant. The use of fresh air and natural ventilation when combined with an air conditioning system reduces energy consumption and by reusing warm air (expelled from a building) to provide heat back into the building is better than warming-up outside air.

## 4 Next steps

59. The Market Transformation Programme has carefully reviewed the existing evidence and taken into account these stakeholder responses and any new information or data. The original projections for the future performance of air conditioning products are being reviewed along with options for the ongoing improvement.

60. The outcome of this process is published in the separate document entitled 'Policy Brief for Air Conditioning Products' which provides an update of the baseline information provided in the original Consultation Document. While the formal consultation process has closed, engagement on the standards will continue as part of an annual reviewing and updating process.

## Appendix 1 - List of respondents

<b>Spaceair</b>
<b>Energy Saving Trust (EST)</b>
<b>Federation of Environmental Trade Associations (FETA)</b>
<b>Mitsubishi Electric UK</b>