

# BNCK06: Trends in kettle type and usage and possible impact on energy consumption

Version 2.1

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis form part of the Evidence Base created by Defra's Market Transformation Programme.

## 1 Summary

It is estimated that 97% of UK households own a kettle which together consume approximately 4.22 TWh of electrical energy per year. Over the past five years, the design of kettles has altered owing to changing kitchen fashions and the introduction of new features<sup>1</sup>. Assuming that user habits have not changed, the kettles currently entering the market are more likely to use more energy than the previous generation. The new features and design changes may directly or indirectly lead to greater energy use. The type of materials used may also impact on environmental lifecycle assumptions for this product.

This Briefing Note discusses the effect in terms of energy use of an increase in the market share of such kettles, and what possibilities exist to reverse the trend for kettles with greater energy consumption. It also describes a product already on the market that, when the instructions are followed, reduces energy consumption by an average of 30% by restricting water use in the kettle.

## 2 Introduction

This Briefing Note aims to:

- Outline the recent history of kettles.
- Summarise the different types available and their energy use implications.
- Summarise options for the future.

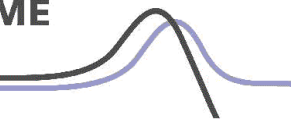
## 3 Kettle developments

The electric kettle is a rapidly changing, small domestic appliance that sets and reacts to design trends. Around 7.74 million kettles were sold in the UK during 2006<sup>2</sup>. MTP projections estimate kettle lifespan at 4.4 years; however, on the basis of sales figures this may be falling to nearer to 3.5 years<sup>3</sup>. Many recent design

<sup>1</sup> 86% of cordless kettle purchasers choose their kettle to match their kitchen décor. BRMB/Mintel, November 2004 survey of 1024 adults aged 15+.

<sup>2</sup> GfK 2006 sales figures.

<sup>3</sup> GfK sales figures support the idea that kettles are replaced at intervals of around 3.5 years.



trends and new innovations may mean that kettles are using more energy than their predecessors. It is estimated that 97% of UK households own a kettle which, in 2005, consumed approximately 4.22 TWh/year. This is approximately 27% of all electricity used in domestic cooking<sup>4</sup>. The type of materials used in kettle construction may have implications for energy and material consumption in the production phase and for the end-of-life waste disposal of these items.

### 3.1 Volume and minimum capacity

The design of kettles has changed so that they hold larger volumes of water, with many kettles now holding 1.7 litres of water or more,<sup>5</sup> and some holding close to 2 litres. Larger kettle capacities may mean that users habitually over-fill them by a greater amount of water, and so increase energy use. Owing to a lack of user habit data, MTP projections do not currently include greater energy use because of increased volume.

As well as an increase in total kettle capacity, a trend for wider-based, traditional-style kettles means that the average minimum capacities required to cover the element have increased<sup>6</sup>. Consequently, even if users attempt to restrict the water they use, they may still be using more water than they need because some kettles cannot boil a minimum of 0.25 litres (one cup). Owing to a lack of user habit data, MTP projections do not currently include greater energy use because of wider-based models.

### 3.2 Power rating

Kettles have also become more powerful: 3 kW rapid boil kettles were rare in 1997, when ratings were typically 2.2 kW, but are common in 2005<sup>7</sup>. Power has been increased to give faster boil times, but this may mean that consumers are less concerned about over-filling the kettle, as the water does not take long to boil.

### 3.3 Water level indicators

Most kettles now have dual water level indicators<sup>8</sup>, features that were rare in 1997. Having a water level indicator to judge the water more accurately has been seen as a key way to encourage people to boil only the water they need. However, poor positioning and labelling of water level indicators mean that consumers often find it difficult to accurately measure the water and so may not use the indicators at all.

### 3.4 Cordless kettles

The number of cordless kettles has also increased so that the majority of new kettles now have a base on which they are located<sup>9</sup>. Ownership of cordless kettles was estimated at 68% in 2004<sup>10</sup>. The base on which kettles are located is now being

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<sup>4</sup> See Briefing Note BNCK01. Assumptions underlying the energy projections for cooking appliances <http://www.mtprog.com/ApprovedBriefingNotes/PDF.aspx?intBriefingNoteID=204> and What-If figures <http://www.mtprog.com/Whatlf.aspx>

<sup>5</sup> 69% of kettles on sale in Argos Autumn/Winter 2006 catalogue had a capacity of 1.7 litres or more.

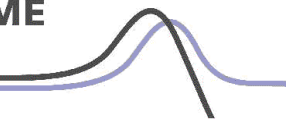
<sup>6</sup> Published *Which?* reports and Intertek test data show that average minimum capacities have increased from 325 ml to 376 ml between 1997 and 2005.

<sup>7</sup> 73% of kettles on sale in Argos Autumn/Winter 2006 catalogue had a power rating of 3 kW or more.

<sup>8</sup> GfK figures show that most plastic kettles sold in 2002 had a water level indicator. 99% of kettles on sale in Argos Autumn/Winter 2006 catalogue have a water level indicator.

<sup>9</sup> 99% of kettles on sale in Argos Autumn/Winter 2006 catalogue were cordless.

<sup>10</sup> BRMB/Mintel, survey of 978 adults aged 15+ in 2003 and 1024 in 2004.



utilised to introduce additional features that may lead to increased energy use.

These include:

- Water filter kettles that have an electronic reminder display to indicate to the user when the filter needs changing<sup>11</sup>.
- A keep-warm facility to keep hot water on stand-by.
- Illumination of kettles has changed from simple 'on' lights to indicate the kettle is boiling, to flashing LEDs in the base, stand-by illumination, internal illumination during boiling, and three-colour illumination to indicate different stages of boiling<sup>12</sup>.
- Kettles with a whistle function on boil.
- Kettles with temperature selectors.

Many of the kettles with additional features also have a stand-by mode, meaning that a light or display is on even when the kettle is not in use, a function that will also increase energy use. An initial investigation of a keep-warm function by MTP suggests that 66 W are used to keep a half-full kettle warm, and 1.5 W during stand-by when the kettle is off.

### 3.5 'Energy saving' kettles

A number of different approaches to kettle design are emerging that aim to reduce the amount of energy used by consumers when boiling kettles. These include:

- Tactics to reduce the amount of water that consumers boil each time.
- Insulating the kettle to keep water hot enough to use and to reduce energy if the kettle is re-boiled.
- Instantaneous water heating to deliver one cupful of water at just below boiling point.

#### 3.5.1 Reducing water

A kettle that was designed to reduce energy use, the Eco Kettle, was introduced onto the market in 2004. The Eco Kettle is designed to hold 1.5 litres of water ready to use, but with the press of a button the user can choose exactly how much water to boil, from a minimum of one cup to a maximum of eight<sup>13</sup>. Independent tests on the Eco Kettle showed that, on average, consumers could save 30% of energy when compared to their normal kettle and habits if they followed the instructions for the kettle. This kettle has been promoted to consumers under the Energy Efficiency Commitment scheme 2005-08.

Another similar product, the 'Plunger Kettle' was launched in 2005<sup>14</sup>. This version allows the user to measure 285 ml cupfuls of water into the boiling chamber by lifting the handle and pushing the plunger to force the water through a water filter. The product claims to save energy, but there are no test results available to confirm whether it does or not.

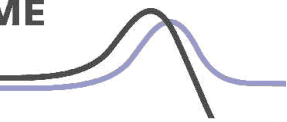
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<sup>11</sup> Water filter kettles were owned by 13% of people in a BRMB/Mintel, survey of 1024 adults aged 15+ in 2004.

<sup>12</sup> In the Argos Autumn/Winter 2006 catalogue, 28% of kettles on sale had some form of illumination other than an 'on' light, and keep-warm was a facility on 9%.

<sup>13</sup> [www.Ecokettle.com](http://www.Ecokettle.com) Accessed 20/08/07

<sup>14</sup> [www.plungerkettle.com](http://www.plungerkettle.com) Accessed 28/06/07



## 3.5.2 Insulation

Russell Hobbs has attempted to reduce the amount of energy used to re-boil kettles by creating a product with insulated walls. Russell Hobbs claim that their Energy Saving Thermal Kettle can keep boiled water warm enough for coffee for three hours and that energy can be saved if the water is re-boiled because the start temperature is higher than in a traditional kettle<sup>15</sup>. There are no test results available to confirm whether energy savings are made in domestic use.

## 3.5.3 Instantaneous water heating

Using a different approach, Tefal has recently launched the 'Quick Cup', a free-standing instantaneous water heater for hot drinks<sup>16</sup>. It is claimed this product could reduce energy use by 65% compared to a standard kettle. It delivers up to 220 ml of water by pressing a button in 3 seconds. The water is not heated to boiling point and therefore may not be suitable for functions such as preparing baby milk that require boiled water. There are no test results available to confirm whether energy savings are made in domestic use.

## 3.6 Policy measures

Kettles that can demonstrate a 20% saving over jug kettles can be considered as qualifying for supply by energy companies as an innovative action under the terms of the Energy Efficiency Commitment 2005-08. The Energy Saving Trust Energy Saving Recommended Scheme (ESR) has set similar criteria for energy saving, and kettles must also demonstrate that they have passive standby of less than 1 W and also that they can boil a minimum of 250 ml<sup>17</sup>. The ESR scheme also includes instantaneous water heaters.

## 3.7 Kettle materials

Kettles contain a range of construction materials, and all include metal, plastic and electronic components. In terms of body materials, Table 1 shows the percentage of sales in 2005.

**Table 1 Percentage sales by body type in 2005 and 2006<sup>18</sup>**

Material	2005 Sales %	2006 Sales %
Glass	2	2
Metal	37	40
Plastic	61	58

<sup>15</sup> Russell Hobbs Energy Saving Thermal Kettle

[http://www.russellhobbs.com/products/index.aspx?path=/products/kettles/energy\\_saving\\_thermal\\_kettle](http://www.russellhobbs.com/products/index.aspx?path=/products/kettles/energy_saving_thermal_kettle)

<sup>16</sup> [www.quickcup.co.uk](http://www.quickcup.co.uk) Accessed 28/06/07 and London Evening Standard

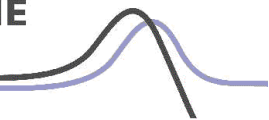
<http://www.thisislondon.co.uk/news/article-23399952-details/Kettle+that+will+give+you+a+cuppa+in+just+three+seconds/article.do> Accessed 28/06/07

<sup>17</sup> For EEC criteria see:

[http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Documents1/EEC2005-2008%20Innovative%20Action-decisions%20document%2024\\_11\\_05.pdf](http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Documents1/EEC2005-2008%20Innovative%20Action-decisions%20document%2024_11_05.pdf) and for ESR criteria see

[http://www.clasponline.org/productssummary.php?country=UK&product=Kettles%20\(Electric\)](http://www.clasponline.org/productssummary.php?country=UK&product=Kettles%20(Electric))

<sup>18</sup> From GfK sales figures for 2005 and 2006.



Kettles are covered by the Waste Electrical and Electronic Equipment (WEEE) Directive under Category 2 - Small household appliances. The WEEE Directive sets a target of 50% by an average weight per appliance for re-use or recycling and 70% by an average weight per appliance for recovery of small household items<sup>19</sup>.

## 4 Energy use scenarios

Cooking appliances accounted for approximately 23 TWh of energy consumption in the UK in 2005. Of this, kettles use approximately 4.22 TWh. There is potential for both savings and increases in energy used by kettles.

### 4.1 Best and worst cases

It is not known how extensively consumers use the keep-warm facility but a worst case scenario has been calculated that demonstrates the potential wastage of keep-warm kettles as opposed to the best case of reduced use with an eco kettle for the whole stock of kettles (based on 2005 ownership estimates). The standard and eco kettle figures are based on 1,542 uses per year, the keep-warm kettle on 70% of that figure. The number of times the keep-warm kettle is used is reduced to reflect an estimated number of times the kept warm water is reboiled, compared with the standard scenario which includes both boiling from cold and reheating any warm water that remains in the kettle. Compared to the reference scenario, if the best-case scenario were achieved, 1.26 TWh of energy could be saved, which equates to a total saving of 0.20 MtC. If the worst-case scenario were realised, 1.96 TWh of energy would be added, a figure that equates to an additional 0.29 MtC (see Table 2).

**Table 2 Energy use and carbon consumption comparison of normal, keep warm, and eco kettles<sup>20</sup>**

	Energy use per kettle per year (kWh) <sup>21</sup>	Total energy use per year of all kettles (TWh)	Energy saved/added per year (TWh)	Total carbon consumption per year (MtC)	Carbon saved/added per year (MtC)
<b>Standard kettle</b>	169.6	4.22	-	0.62	-
<b>Eco kettle</b>	118.72 <sup>22</sup>	2.96	1.26 saved	0.43	0.20 saved
<b>Keep-warm kettle</b> <sup>23</sup>	248.26	6.18	1.96 added	0.90	0.29 added

<sup>19</sup> <http://www.berr.gov.uk/files/file35992.pdf>

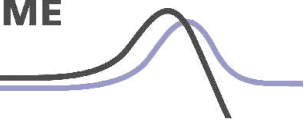
<sup>20</sup> Calculated using MTP Briefing Note BNCK01

<http://www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNoteID=204> and Intertek RPT calculations based on heating 1 litre of water, and figures from the ODPM.

<sup>21</sup> MTP Briefing Note BNCK01

<http://www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNoteID=204> and Intertek RPT calculations based on heating 1 litre of water.

<sup>22</sup> Calculated as 70% of the estimated annual use of 169.6 kWh per year, which is assumed to use 0.11 kWh/use and is used 1542 times per year. See MTP Briefing Note BNCK01 <http://www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNoteID=204>.



## 4.2 Effect of reduced temperature kettles

Kettles with temperature selectors could also be used to reduce carbon emissions by selecting the recommended temperatures for coffee (approx 95°C) and speciality teas (80°C)<sup>24</sup>. Assuming that all kettle use is for hot drinks, and that 33% of times the kettle is boiled is for coffee and 66% for tea, of which 7% are speciality teas<sup>25</sup>, 0.22 TWh of electricity, or 0.035 MtC, could be saved each year by just heating the water to the recommended temperature for each drink (see Table 3). These figures could be proportioned differently if evidence is produced for the actual percentage of kettle energy that is used for hot drinks.

**Table 3: Energy use comparison of reducing water temperatures for different drinks<sup>26</sup>**

	Energy used per kettle (kWh)	Total stock (TWh)
Tea (100°C) 59% of all uses	104.10	2.59
Speciality tea (80°C) 7% of all uses	5.60	0.14
Coffee (95°C) 33% of all uses	51.09	1.27
<b>Total</b>	<b>160.79</b>	<b>4.00</b>

## 5 Options for the future

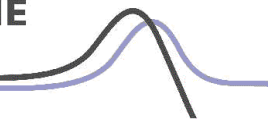
- The Energy Saving Trust (EST) to encourage users to boil only the amount of water necessary and demonstrate 30% savings. RISK: Consumer habits may be difficult to change.
- Kettle manufacturers to encourage use of reduced temperature kettles, especially by speciality tea drinkers, and to demonstrate 6% savings. RISK: Consumers may reject the idea of non-boiled water.
- Industry to create a voluntary kettle mark that indicates to consumers that the kettle can boil a set minimum amount of water (eg. one cup (250 ml) and encourage users to boil only the water they need by highlighting the potential to save 30%. RISK: Manufacturers may be reluctant to accept such a scheme as it may add additional costs on implementation.
- Industry to introduce voluntary energy efficiency scheme for kettles and other small kitchen appliances to raise awareness of energy use and to highlight options for energy saving. RISK: Cost of introducing such a scheme, possible reluctance of manufacturers and retailers, lack of consumer knowledge about what the labels actually mean once introduced.
- If consumers really want a keep-warm function, then the industry should design more energy efficient, keep-warm kettles that do not increase energy consumption above that of standard kettles. RISK: Energy efficient keep-warm technology may

<sup>23</sup> Based on a cycle of boiling a full kettle, emptying half, and keeping warm for 40 minutes once per day (Table 1).

<sup>24</sup> [www.nbtea.co.uk/tea-water.php](http://www.nbtea.co.uk/tea-water.php) Accessed 20 August 2007

<sup>25</sup> Tea outsells coffee by 2 to 1 <http://www.tea.co.uk/news.php?showItem=118> Accessed 3 October 2006.

<sup>26</sup> Intertek RPT figures, August/September 2005.



be difficult and expensive to produce and the extra cost may be passed on to the consumer.

- Industry to extend the average lifespan of a kettle by improved design and reducing the consumers' need to buy a kettle to match their décor by making kettles that will suit all kitchens rather than following fads and trends. RISK: Kitchen fashions are still changing regularly and manufacturers are responding by producing more and more 'fashionable' kettles.
- Lifecycle analysis of different kettle body types is needed to identify kettles with lowest environmental impact.

## Related MTP information

- MTP Briefing Note BNCK01 Assumptions underlying the energy projections for cooking appliances  
<http://www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNoteID=204>
- The projections are available in the What-If Tool  
<http://www.mtprog.com/WhatIf.aspx>

## Changes from version 1.6

New carbon emission factors from BNXS01c used in all carbon predictions – see sections 4.1 and 4.2.

## Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided, email [info@mtprog.com](mailto:info@mtprog.com) quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

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