An examination of the effectiveness of the EU minimum standard on cold appliances: the British case

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1. SYNOPSIS

The minimum standard on cold appliances came into force 3 September 1999. As a result substantial savings have been achieved. This has occurred in the context of falling real prices.

2. ABSTRACT

Monitoring the effectiveness of policy is an essential part of securing energy savings. This paper investigates the effectiveness of the minimum standard on cold appliances using the British market as a case study. Data availability on developments in the cold appliance market in Britain is very good compared to most other EU markets, permitting an unbroken quarterly analysis from 1995 onwards.

The timing and magnitude of savings is shown in the context of historical rates of change, the aspirations of Directive 96/57/EC as well as the development in price. At the time of its adoption in 1996, the standard presented a significant challenge to the British market. On the whole, manufacturers delayed efficiency improvements in the British cold appliance market for as long as possible – until just before the standard came into force. Nevertheless significant reductions in energy consumption have been made as a result of the minimum standard in the context of falling real prices.

3. INTRODUCTION

Cold appliances (refrigerators, freezers and fridge-freezers) consume a significant amount of energy: currently some 109 TWh or 18% of household electricity consumption in the EU15 (Fawcett *et al* 2000). This appears to be roughly in line with projections in the 1993 *Study on Energy Efficiency Standards for Domestic Refrigeration Appliances* (Group for Efficient Appliances 1993) which projected that energy consumption by cold appliances would drop from 111 TWh to 94 TWh between 1992 and 2010 (in the EU12) due to improvements in technology.

The study by the Group for Efficient Appliances (GEA) argued that through a combination of short (10-15% by 1995) and long-term standards (by 1999 or 2001), the energy consumption of cold appliances on the EU12 market 1990-92 could be reduced by 38-50% - depending on the model. This was based on a combination of technological options resulting in the minimum life cycle cost to the consumer. The effect on total energy consumption was estimated to be at least a 35% reduction in energy consumption, from 94 TWh to 61 TWh in 2010.

The minimum standard, which eventually came into force 3 September 1999, was the result of a compromise between the Commission, industry, the Energy Council and the European Parliament (Table 1). It was designed to achieve a 15% reduction in the energy consumption of the average new cold appliance by 1999 over the 1990-92 level.

Table 1. Minimum efficiency level for cold appliances 3 September 1999

	Energy class
Refrigerators	C
Fridge-freezers	C
Upright freezers	C
Chest freezers	E

However, article 8 of the minimum standards directive makes reference to a 'second stage' which would involve a consideration of "the need to lay down a second set of appropriate measures for significantly improving energy efficiency" (European Commission, DGXVII, 1996). A figure of an additional 20% improvement to the 1992 baseline by 2003 has been mentioned by the Commission (June 1999a) but this is subject to the findings of the current market study and subsequent negotiations. It remains to be seen whether the final result will be a mandatory minimum standard or an industry agreement, and how ambitious it will be.

A combination of the current standard at 15%, and an additional level of 20%, would be at the lower end of the cost-effective potential identified by the GEA study, furthermore the delay has meant that the cumulative savings will be lower than projected. The Commission expects that the savings from the combination of short and long term minimum standards would be 9 TWh per year by 2010 (European Commission, DGXVII, June 1999).

4. DEVELOPMENTS IN ENERGY EFFICIENCY AND ENERGY CONSUMPTION OF COLD APPLIANCES ON THE BRITISH MARKET.

This section examines the development in energy efficiency and energy consumption of cold appliances on the UK. The analysis is based on sales data from the market Research company GfK. The sales data covers branded sales on the British market – that is to say sales which are not sold under the retailers own brand. Past analysis has suggested that the unbranded market tends to be less energy efficient than the branded market. When the energy labelling of cold appliances came into effect in 1995, information on net volume, energy consumption and other model characteristics necessary for this analysis became more readily available on a regular basis. Data from 1995 onwards is therefore mainly used. The latest quarterly data to be available is quarter 3 2000, i.e. four quarters' worth of data subsequent to the introduction of the minimum standard are now available.

Cold appliances in the UK consumed about 17 TWh of electricity in 1992. By 1999 this had risen to 17.5 TWh, about 16% of household electricity consumption, and is expected to decline to 16 TWh by 2010 as a result of improvements in energy efficiency including the effect of the minimum standard and the energy label.

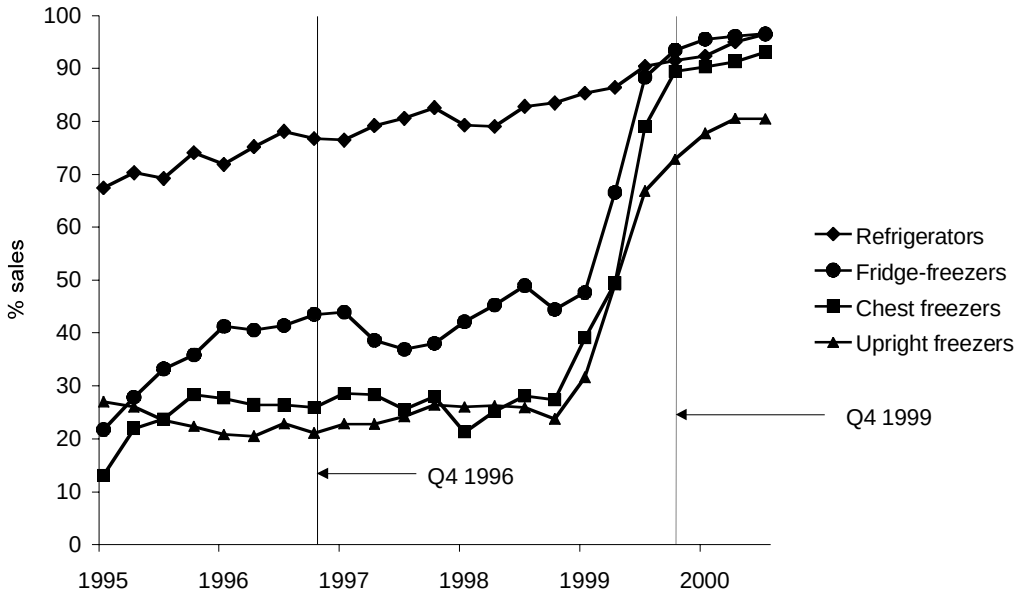
Improvements in energy efficiency

Sales by energy label

The proportion of sales of cold appliances meeting the minimum standard from 1995 to quarter 3 2000 is shown in Figure 1. Over the period the proportion of total sales meeting the standard grew from 40% to 93%. By quarter 4 1996, the quarter after the legislation for the minimum standard was adopted, 48% of sales met the standard, ranging from 21% of upright freezers to 77% of refrigerators. By quarter 4 1999, the first full quarter after the minimum standard had come into force, this had risen to 89%, ranging from 73% of upright freezers to 93% of fridge-freezers.

In spite of substantial improvements, during 1999 in particular, it appears from Figure 1 that more than one year after the minimum standard came into effect, a substantial proportion of cold appliances did not meet the minimum standard. The upright freezer market is most behind, with 20% of sales still not meeting the standard. In the refrigerator, fridge-freezer and chest freezer markets about 95% of sales meet the standard. However the refrigerator market was always much closer to full compliance than the other markets.

Figure 1. Cold appliances meeting minimum standard, GB 1995-Q3 2000, GfK branded, sales weighted



This suggests that retailers had a substantial stock of products that did not meet the standard when the legislation came into effect even with three years notice. An alternative explanation would be that models that do not meet the standard continue to be placed on the EU market illegally. It could also be that manufacturers make changes to model so that they comply, but without changing the model number and without informing GfK that the energy class of models has changed.

At present it is not clear what the real explanation is, although recent data analysis points toward the third explanation. It has not been possible to obtain confirmation of this from manufacturers at the time of writing. At best this poses a problem for those who try to monitor the effectiveness of other policies on the basis of market data, at worst the effectiveness of policy is being undermined. These issues can be overcome. Manufacturers could be required to deposit information about models in a publicly available database prior to placing them on the market. And instead of putting a duty on manufacturers not to place non-compliant products on the market from a certain date, a duty could be placed on retailers, prohibiting the sale of products at the point of sale. In this way non-conformity could easily be picked up as part of routine monitoring of compliance with the energy label. Such an approach would reinforce the need for regular monitoring of retailer compliance with the energy label (Schiellerup and Winward 1999).

The GfK data suggests that manufacturer response to the standard has been delayed until the last moment as far as the British market is concerned: in the fridge-freezer and freezer markets very little improvement was made between September 1996 when the legislation for the standard was adopted and 1998. It is only in 1999 that substantial changes start taking place. The picture is different in the refrigerator market where the proportion of sales meeting the standard increased steadily over the whole period.

It seems clear that without minimum standards the improvements shown from quarter 1 1999 would have happened much more slowly in the UK.

Developments in energy efficiency index

The labelling scheme is based on an ‘energy efficiency index’ generated by comparing the appliance with the average European model when the bands were set at the end of 1993, using values that vary according to the category of appliance. This average is constant, and was set at the point dividing classes D and E, to allow for efficiency improvements over time. The energy efficiency index is continuous, while the label groups each appliance into one of seven classes. The class into which the individual appliance falls is determined by segmenting the energy efficiency index as outlined in Table 2.

Table 2. Energy efficiency index and energy efficiency classes

Energy efficiency index: I			Energy efficiency class
	I	< 55	A
55 _	I	< 75	B
75 _	I	< 90	C
90 _	I	< 100	D
100 _	I	< 110	E
110 _	I	< 125	F
125 _	I		G

Source: European Commission, DG XVII, 1994

The energy efficiency index is derived from dividing annual energy consumption by the net volume of the appliance (adjusted to equalise for different temperature zones). It effectively reflects the consumption in kWh per litre of net volume. Thus it is possible to compare appliances, even though they are of varying sizes with different proportions of cool and frozen space.

Figure 2. Energy efficiency index, GB 1995-Q3 2000, GfK branded, sales weighted

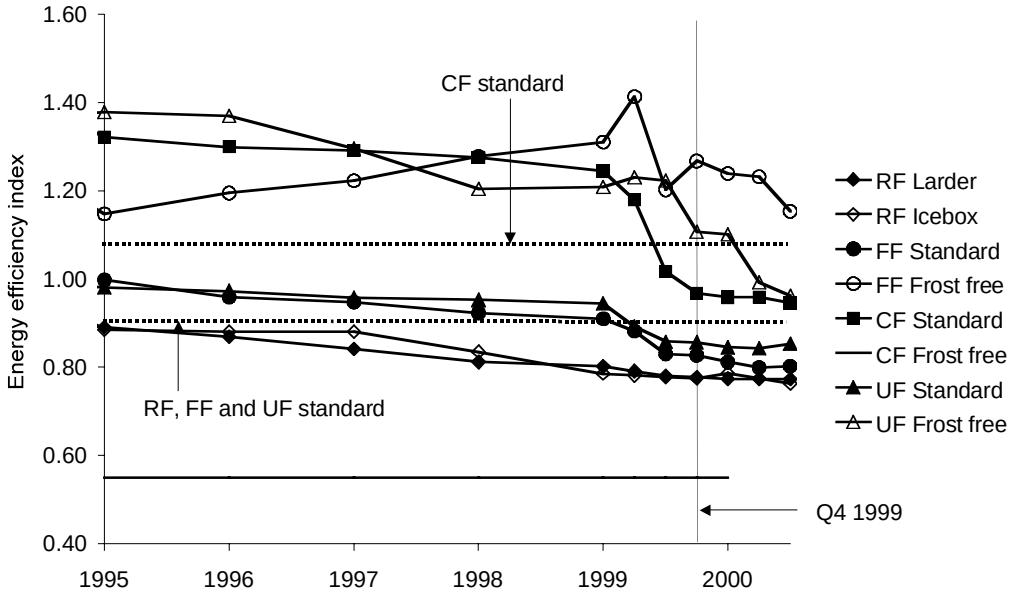


Figure 2 shows the development in energy efficiency index between 1995 and Q3 2000. It mirrors the development in the proportion of appliances meeting the standards shown in Figure 1 and trends in energy consumption shown in Figure 3.

The improvement in energy efficiency between 1992 and Q4 1999 indicated by the GfK sales data ranged from 0 for frost free chest freezers (based on one model only), to 27% for icebox refrigerators. This is lower than the cost-effective savings potential identified by GEA in 1993. Some of these improvements did not result from the minimum standard but from autonomous increases in energy efficiency and the effect of the energy label, introduced in 1995. The mandatory minimum standard has had the effect of ensuring a certain level of improvement over a defined time period.

Table 3. Improvements in energy efficiency 1992-Q4 1999

	RF Larder	RF Icebox	FF Standard	FF Frost free	CF Standard	UF Standard	UF Frost free
1992	**1.01**	**1.07**	**1.07**	**1.57**	**1.48**	**1.03**	**1.36**[1]
Q4 1999	**0.79**	**0.78**	**0.88**	**1.41**	**1.18**	**0.89**	**1.23**
% improvement	**22**	**27**	**17**	**10**	**20**	**13**	**9**

Source: GfK sales data

Developments in energy consumption

The directive was designed to achieve a reduction in energy consumption of the average model by 15% by 1999 over the 1992 level.

Figure 3 Energy consumption, GB 1989-Q3 2000, GfK branded, sales weighted

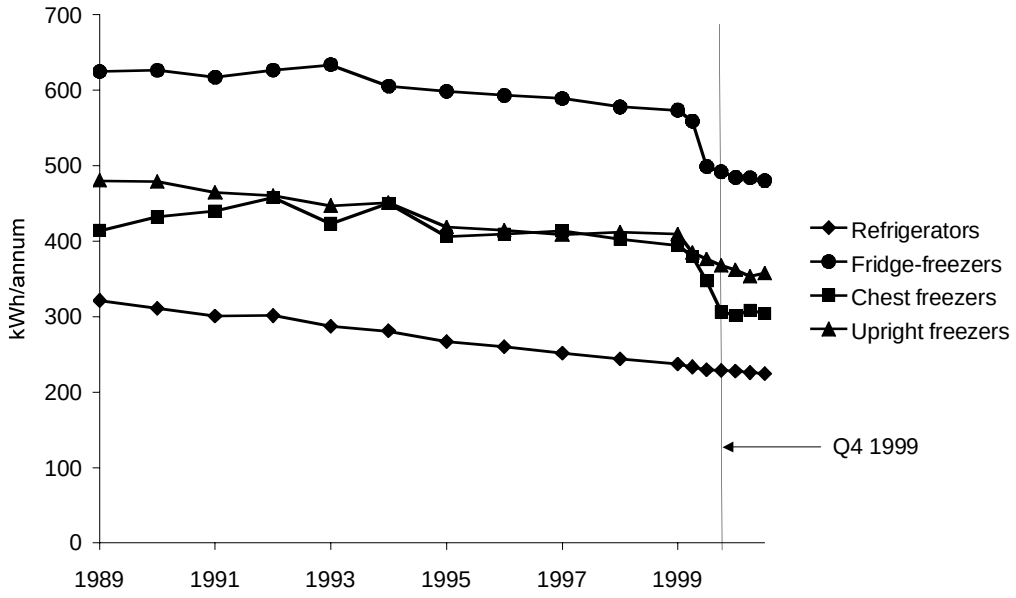


Table 4 shows reduction in energy consumption between 1992 and quarter 4 1999. This ranged from 20% for upright freezers to 33% for chest freezers, well in excess of the aspirations of the minimum standard, but it should be taken into consideration that it is possible that products sold in Britain consumed more energy than the EU average. As with energy efficiency, some of the improvement would have been achieved through autonomous improvements combined with the effect of the energy label.

Table 4. Reduction in energy consumption 1992-Q4 1999

	Refrigerators	Fridge-freezers	Chest freezers	Upright freezers
1992	301	627	458	460
Q4 1999	228	492	306	368
% reduction in energy consumption	24	22	33	20

Source: GfK sales data

Energy savings to the consumer can be estimated by comparing the energy consumption in 1998 to a projection for the whole of 2000 based on the structure and volume of sales in 1998 (Table 5). Some 3 TWh of electricity will be saved as a result of the reduction in energy consumption over the period, resulting in electricity bills reduced by £205m over the lifetime of the appliances and a saving of 0.33 MtC. Of course this estimate is highly

sensitive to assumptions about the life-time of appliances. It should therefore be noted that the lifetimes shown in Table 5 are based on the total lifetime of the appliance including life as a second hand appliance.

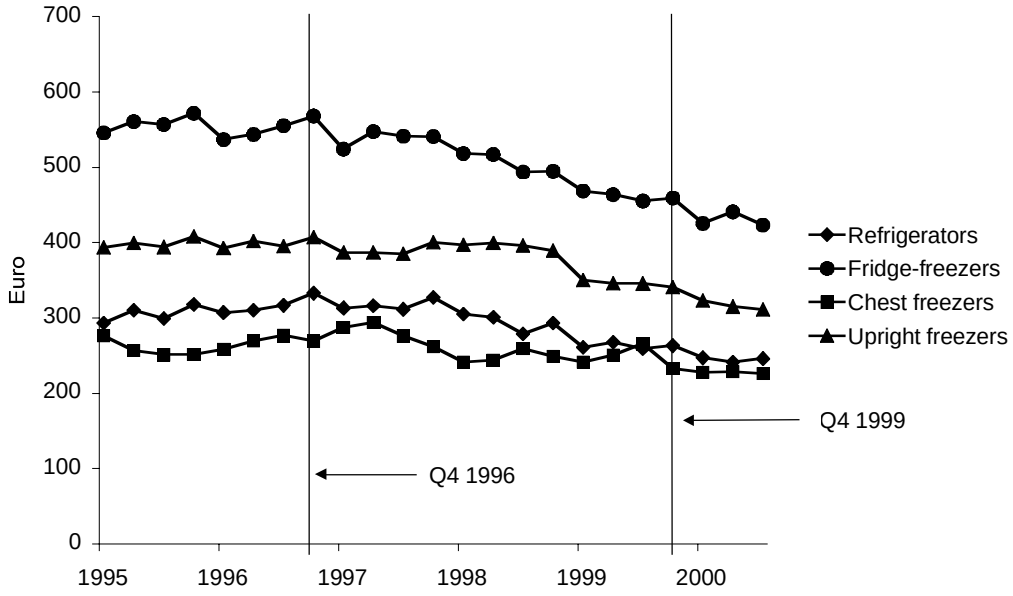
Table 5. Lifetime savings from cold appliances bought in 2000

	Bought 1998	Bought 2000[2]	Reduction	Lifetime	Unit lifetime savings		Total sales 1998[3]	Lifetime savings from all apps bought in 2000[4]		
	KWh/y	kWh/y	%	Years	kWh	£		GWh	£(m)	MtC
RF	244	226	7	13	237	17	921,045	218	15	
FF	577	484	16	18	1677	117	1,069,013	1,793	125	
CF	402	308	23	17	1593	112	295,728	471	33	
UF	412	353	14	15	880	62	501,061	441	31	
								2,923	205	0.33

Impact on retail price

The introduction of the minimum standard did not result in an increase in the retail price of appliances. Real prices continued to fall in the four quarters after the minimum standard came into effect. This suggests that, with hindsight, even more ambitious targets could have been achieved without increasing the lifetime cost of the appliance to the consumer.

Figure 4 Price of cold appliances, GB 1995-Q3 2000, GfK branded, sales weighted



5. THE EFFECT OF OTHER POLICIES

From the point of view of transforming the cold appliance market in the UK towards more efficient appliances the most important policy instruments have so far been the EU energy label and the recently implemented EU minimum standard (Table 6).

Table 6. Summary of European policy instruments

Instrument	Directive	Minimum efficiency level	In force[5] /target date
1st label	94/2		1.1.1995
1st minimum standard	96/57	C except for chest freezers where it is E	3.9.1999
Eco-label	-	42% on the energy efficiency index	19.1.2000 to 1.12.2002

Source: Fawcett *et al* (2000) updated with European Commission, DGTREN, (2000).

Since the mid-1990s, a number of subsidy schemes have been carried out by the electricity utilities and on behalf of the utilities by the Energy Saving Trust as part of the Standards of Performance schemes (Table 7). However, because of a combination of their limited scale and lack of focus on the top end of efficiency in the market it is not likely that UK subsidy programmes have had appreciable market transformation effects although they will have resulted in energy savings. They will have made very little impact on the average kWh consumption of appliances sold.

Table 7. Summary of recent UK subsidy schemes

Appliance	No. Subsidised/year	Scale of Programme	Comments
Cold	Approx. 40,000 per year since mid 1990s	Equivalent to 1.5% of new sales	Includes some subsidies through the Fridge-savers scheme for low-income households, which provides a new efficient refrigerator or fridge-freezer (not necessarily A rated) very cheaply in exchange for an old working one.

Source: Fawcett *et al* (2000)

However, the third round of the Standards of Performance scheme (SoP3 April 2000-March 2002) and in particular the successor to the SoP scheme, the Energy Efficiency Commitment (April 2002-March 2005), will substantially increase the level of funding available and will therefore have the potential to influencing the market to a greater extent provided the subsidies are targeted at best and advanced practice technology.

6. CONCLUSION

The EU minimum standard was a compromise between the Energy Council, the Commission, the European Parliament and industry. As a result it was substantially less ambitious than the standards recommended by GEA. Nevertheless the standards did represent substantial improvement in the efficiency of the UK cold appliance market. A year after the standard came into effect, close to 95% of the refrigerator, fridge-freezer and chest freezer markets meet the standard. In the upright freezer market 20% of products still did not meet the standard. While this is in principle legal, the delay in meeting the standard does raise questions about the design of future standards. As a result of the standard substantial energy and financial savings will be made by households in the UK. This has been achieved against the background of falling real prices of cold appliances. This is good news for environmental protection and good news for electricity consumers. However substantial additional savings are available through an integrated programme of standards, revisions to the label and market building instruments (Fawcett *et al* 2000). The importance of standards is that they ensure a specified level of improvement in technology to a specific timetable for society and that they provide a planning framework for industry. They are therefore likely to form the backbone of any broader market transformation strategy.

7. REFERENCES

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8. END NOTES

[1] 1994 – value not available for 1992

[2] Using Q2 2000 as representative of 2000 as Q4 not available and using Q1-3 would underestimate savings because of the expected continued increase in sales meeting the standard.

[3] Branded and unbranded sales

[4] The estimation for 2000 is based on total sales in 1998.

[5] In force indicates the date on which the provisions should be in force in the member states, e.g. the date from which energy labels should be on the appliances in the shops