

Are voluntary agreements an alternative policy to efficiency standards for transforming the electrical appliances market?

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1. SYNOPSIS

This text deals with the effectiveness of negotiated agreements compared to mandatory approaches in transforming the electrical appliance market.

2. ABSTRACT

Without reinforced energy saving policies, residential consumption of electricity will rise sharply over the next twenty years, due in particular to the expected increase in non-thermal uses of electricity. The main problem is not a lack of efficient technologies, which are already available for electrical appliances, but the slow diffusion of existing technologies due to the weakness of the price signal and purchasing behaviour of consumers. In association with energy labelling, efficiency standards have proved to be very effective in stimulating technological progress and organising market transformation. But standards also suffer from very long delays and problems of implementation because of the resistance of the industrial sector. For manufacturers, similar results could be obtained more easily and more rapidly with voluntary agreements because they introduce flexibility margins into the process of achieving commitments. In this paper, the particular interest of voluntary agreements for improving energy efficiency in the domestic appliances sector is analysed. We conclude that voluntary agreements may be effective tools for attaining market transformation objectives in certain conditions. But the alternative of regulatory measures must remain credible and threatening if the impact of voluntary agreements on efficiency improvement is to be really significant.

3. INTRODUCTION

In France, as in most other European countries, electricity consumption for non-thermal¹ uses has risen steadily over the last few years, particularly in the domestic sector. Because the number of households and the ownership of electrical appliances are still increasing, because new equipment is continually appearing on the market, this electricity consumption is expected to continue to rise in the years to come. The rate at which it may rise in the domestic and tertiary sectors could be at least twice that of average electricity consumption (CGP, 1998).

Given that in France a considerable proportion of electricity is generated by nuclear power stations, electricity consumption for non-thermal uses contributes relatively little to greenhouse gas emissions. This does not mean that this increased electricity consumption is of no consequence. Rising consumption, if not controlled, could have effects on the electricity system (possible extension of electricity generating facilities, upgrading of transmission and distribution systems) as well as on greenhouse gas emissions when the question of renewing nuclear power stations arises. In order to keep open the options for future electricity generating facilities, demand must not be allowed to rise too rapidly.

With the development of increasingly efficient technologies, this curbing of electricity consumption does not necessarily mean constraints on uses. But the necessary technological progress has to be encouraged by special policy instruments because signals from the market are not strong enough to induce ambitious innovation policies from the manufacturers. At the European level, the strategy over the past years has been to associate two complementary instruments, a labelling programme and minimum energy efficiency standards, in order to stimulate the design and dissemination of more efficient appliances.

This association has proved to be effective in market transformation but minimum efficiency standards are facing regular opposition from manufacturers who fear the negative consequences of this intervention on the

market and also from some member States. As a result, the implementation of minimum standards necessitates a long preparation time and may be costly in terms of information acquisition and negotiation processes. For this reason, some people believe that alternative approaches based on voluntary commitments, giving more flexibility to the private actors, would be much more effective and easier to implement.

The present paper examines this question of the effectiveness of voluntary agreements in transforming the electrical appliance market. The first part of the paper deals with the evolution of electricity consumption related to non-thermal uses and the reasons for the expected rise. The prospects for further technological progress in the energy efficiency of appliances are then assessed in reference to consumer purchasing behaviour. The second part analyses the effectiveness of the regulatory approach through the European experience of minimum efficiency performance standards and energy labelling in the domestic cold sector. The third part examines the theoretical advantages of voluntary approaches and the real advantages that manufacturers find in these agreements compared with efficiency standards. General results of negotiated agreements in the field of energy efficiency and ongoing experience in the washing machine sector are then presented. Finally, we analyse the factors that may influence the effectiveness of voluntary agreements and try to draw some conclusions for public authorities regarding the choice between mandatory and voluntary approaches.

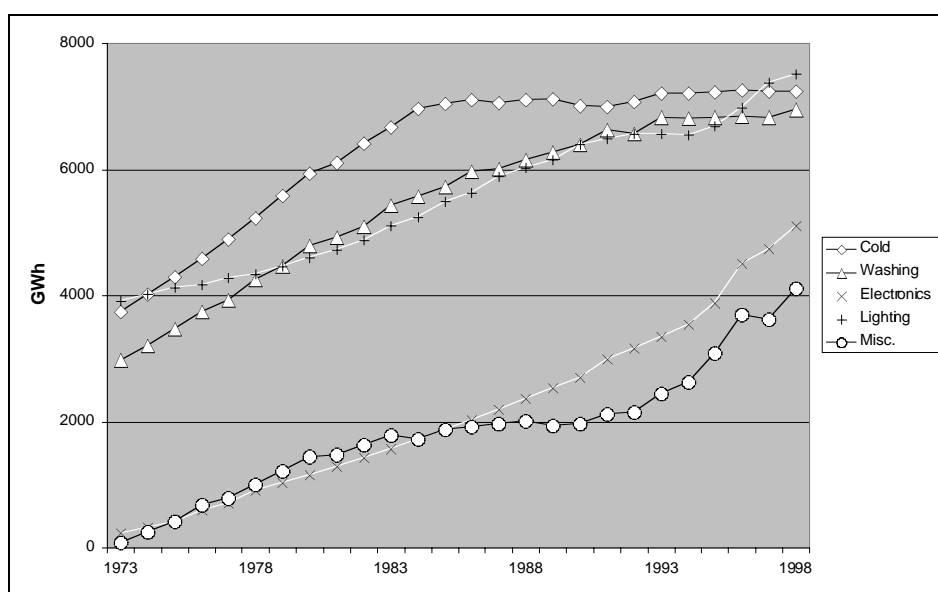
4. STEEP RISE IN ELECTRICITY CONSUMPTION FOR NON-THERMAL USES

Electricity consumption for non-thermal uses

In France, the term electricity consumption for non-thermal uses is commonly used to refer to uses for which there is no alternative power source, for example lighting, electric motors, electronic equipment, household appliances, etc. Unlike uses for which alternative power sources are available, where the increase is relatively moderate, there has been a steady rise in electricity consumption for non-thermal uses over the last few years. Between 1987 and 1997, electricity consumption for non-thermal uses increased by 4.2%/yr, while domestic electricity consumption rose by only 2.5%/yr and total electricity consumption by 2.6%/yr.

Non-thermal uses of electricity can be divided into four main categories: large household appliances (cold appliances, washing machines, etc.), lighting, brown goods (television sets, video cassette recorders, multimedia equipment, etc.) and other appliances (irons, vacuum cleaners, etc.). In the case of large household appliances, refrigerators/freezers and washing machines, the growth in consumption has slowed down since the mid-1980s, due to the fact that ownership of this type of equipment has reached a saturation level (Graph 1)². Since virtually all households now own a refrigerator and a washing machine, any increases in ownership are now simply related to increases in the number of households.

Graph 1. Non-thermal uses of electricity (France)



Source : Ademe, 2000

The same is not true for other household appliances (dishwashers, microwave ovens, clothes dryers and small appliances) where the ownership level is far from saturated. Similarly, no saturation effect can be observed in the case of consumption for lighting, which continues to rise with the increase in the number of households and the number of light sources in each home (Menanteau 1997). As regards brown goods, vigorous sales of equipment associated with the development of audio-visual technologies (multimedia computers, TV, video cassette recorders, DVD players, satellite receivers, *etc.*) show quite clearly that the market is undergoing a period of strong growth, with saturation not foreseeable at present.

It may appear paradoxical that electricity consumption is continuing to increase whereas ownership levels of the main household appliances are no longer rising. Certain needs are still far from being totally satisfied: ownership of dishwashers is thus expected to increase by 50% between 1995 and 2010 while ownership of clothes dryers is expected to double over the same period. Moreover, an increasing number of households have more than one of the same type of appliance, particularly refrigerators and televisions. Finally, the ownership structure may change and lead to higher energy consumption while the actual volume of appliances would remain the same. This was the case for cold appliances, with refrigerators being replaced by refrigerator/freezers, a trend which resulted in a significant rise in unit consumption.

In general, electricity consumption for non-thermal uses in the residential sector should thus continue to rise rapidly over the next few years. A prospective study commissioned by the French government for the years 2010 and 2020 indicated that electricity consumption for non-thermal uses is likely to virtually double over the period 1992 – 2010, while total electricity consumption in the residential sector over the same period is expected to increase by only 40%.

Purchasing behaviour and technological progress

This expected rise in electricity consumption for non-thermal uses is not necessarily inevitable. At least it can be slowed down through the development of increasingly efficient technologies. For this to occur, steady technological progress is required that will contribute to the improvement of household appliance energy efficiency.

It is true that technological progress has contributed for many years to the reduction in the power consumption of household appliances³. But are these improvements the result of a deliberate strategy on the part of the manufacturers to increase energy efficiency?

General advances in technological knowledge have led to regular improvements in the performance of components and have helped to reduce the unit energy consumption of appliances. But these improvements are not the result of a clear strategy in response to demands from the market. In reality, until the introduction of energy labelling, French consumers (like those in most other European countries) did not give preference to the energy efficiency factor when choosing household appliances⁴. The reasons for this lack of interest are well known: insufficient information, apparently limited monetary savings, lack of awareness about running costs, preference for present rather than future savings, etc.

As a result of this consumer indifference, there was no evidence of a market structure based on energy efficiency: the energy efficiency of some top-of-the-range refrigerators was worse than that of appliances which cost two or three times less. Given the lack of interest from consumers, energy performance was not included as a factor in the development strategies of new products. Manufacturers have had no interest in introducing innovation in their new products except where they felt they could gain a competitive advantage. With most consumers expressing no real interest in reducing energy consumption, innovations in this area have been reserved for certain markets, or market niches, where they could enhance the value of the products (top-of-the-range appliances from some manufacturers, or the Northern European markets in general).

Until special policies were introduced to stimulate the adoption of energy efficient technologies, innovation in energy efficiency was unremarkable and concentrated mostly in those European countries that have a greater tradition of environmental awareness. The publication of the European Directive on energy efficiency labelling followed by the introduction of minimum performance standards has considerably transformed the European domestic appliance market and stimulated innovation in energy efficient products.

5. LABELLING AND EFFICIENCY STANDARDS TO STIMULATE INNOVATION

The European policy concerning transformation of the domestic appliance market was implemented essentially through two complementary measures, labelling programs to improve consumer awareness and minimum performance standards. The experience over the last few years has proved, that these very different instruments can co-exist very effectively.

Energy efficiency labelling and purchasing behaviour

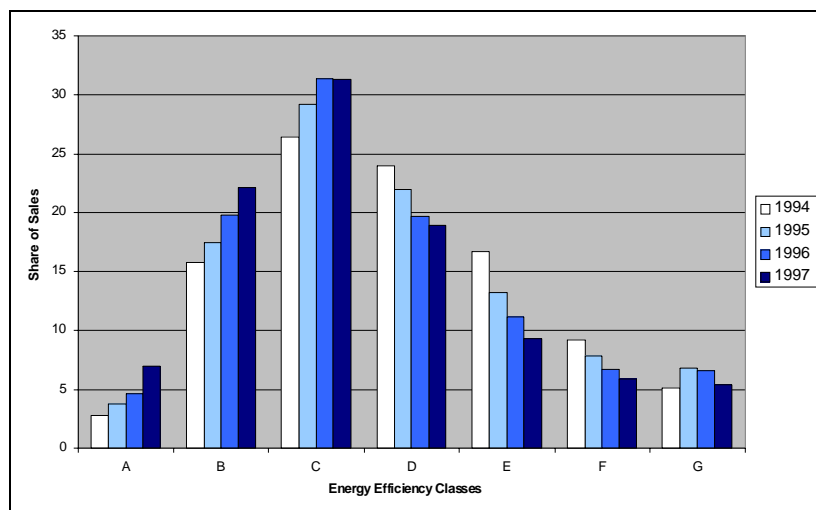
Labelling programs are designed to modify the selection criteria of consumers by drawing their attention to the energy consumption of household appliances. Lack of information for consumers is generally considered to be one of the main barriers to improving energy efficiency. Energy labels provide consumers with information which is often absent from their selection criteria and which enables them to compare the energy efficiency of the different appliances on sale.

Most of the industrialised countries, and a growing number of developing countries, have now introduced labelling programs. At the beginning of the year 2000, about forty labelling programs were in operation around the world (Newman, 2000). Some concern only a limited number of appliances, generally refrigerators and air conditioners in the developing countries, while other programs, in particular in the United States, Australia and Europe, cover the main household appliances.

Following the example of the USA and Canada, Europe introduced a framework for energy labelling in 1992 (comparison labels). The program became effective in 1995 for domestic cold appliances and has gradually been extended to cover other household appliances.

The impact of this measure is difficult to distinguish from the general trend in lower unit energy consumption (cf. supra). An analysis of sales from 1994-97 shows a clear trend towards greater overall energy efficiency in the domestic cold appliance market in Europe, with a significant shift in sales towards more efficient appliances (classes A, B and C) at the expense of the low efficiency classes (E, F and G). Compared with the situation at the beginning of the 1990s, the sales-weighted average energy consumption of cold appliances in the EU has fallen by about 16% (corrected estimates) in 1997 (Waide, 1999).

Figure 2. Cold appliance sales according to Energy Efficiency (European Union)



Source : Waide, 2000

For a majority of European member states, legislation regarding labelling came into force during 1995 and 1996. Even if compliance was still limited at that time, one can argue that the introduction of labelling has accelerated the transformation of the refrigeration market. Paradoxically, this transformation seems to have stemmed less from a change in consumer preferences than from changes in the structure of sales. In reality, the introduction of labelling does not seem to have had a dramatic effect on the main selection criteria of consumers (price, brand, functions, etc. are still at the top of the list)⁵. Labels provide consumers with additional information which they may or may not use depending on their interest in energy efficiency (ECU, 1998).

On the other hand, the influence of labelling on the products available on the market and on the innovation strategies of manufacturers is much clearer. Anticipating changes in consumer preferences or in regulations, manufacturers have discontinued certain models that had become difficult to sell (expensive and not energy efficient), have improved - sometimes marginally - the appliances destined to remain on the market and have gradually introduced new more efficient products. At the international electrical appliance show (Confortec) in 1998, all the manufacturers had, to differing extents, introduced new more efficient models into their product ranges, and some had focussed on energy efficiency by presenting most appliances in classes A and B (Appliance Efficiency, 1998).

Labelling is thus a powerful instrument for differentiating products, and one which can promote innovation among manufacturers who wish to use this device to improve their competitive position or to gain an edge in new market niches. But labelling programs also have obvious limits. Their success depends to a great extent on consumer concern about energy efficiency, on the differences in efficiency between appliances and the related financial stakes, on the complexity of the selection criteria, and so on. Furthermore, labelling does not prevent the least efficient models from remaining on the market nor consumers from buying them. For this reason, labelling programs are generally accompanied by programs imposing minimum energy performance standards.

Labelling and efficiency standards: a necessary complementarity

By definition, efficiency standards are based on a regulatory process which affects all the manufacturers. The aim of standards is to complement labelling schemes or to replace them in cases where the energy price signal is not strong enough to influence consumer choices and encourage the purchase of more efficient appliances.

The impact of efficiency standards on market transformation depends essentially on the minimum energy efficiency level imposed as well as the time allowed for implementation. The procedures for defining minimum efficiency levels differ quite considerably from one country to another.

In China, for example, the standards introduced in 1989 have had only a very slight impact, since 95% of the appliances on the market already complied with the efficiency level imposed, a level which was defined on the basis of a large consensus (Egan *et alii*, 1998). On the other hand, the efficiency levels defined in the standards introduced in the USA on the basis of a technical and economic analysis were particularly stringent. As a result, the average rated electricity use of new refrigerators fell from about 1725 kWh/yr in 1972 to about 653 in 1994, and is expected to reach 475 kWh/yr in 2001.

In Europe, a statistical approach was used to set up standards. Household cold appliances were the first to be subjected to minimum efficiency levels in september 1999. According to the regulation, only appliances belonging to energy efficiency classes A, B and C can be sold⁶. The energy efficiency of the appliances already on the market was used as a basis and the standard was drawn up so as to obtain an improvement of 10 to 15% in the average energy efficiency of new appliances.

The effectiveness of the regulations is evident from the new products presented at the Confortec international electrical appliance show in 2000: all D, E, F and G appliances had been removed from the market, with the exception of chest freezers, for which E-class appliances can still be sold (Appliance Efficiency, 2000). Are we to understand that labelling has just been a preparatory step to the introduction of legislation on energy efficiency, the latter being in the end the most effective instrument for transforming the market ? Does labelling still have an impact or can such schemes be discontinued to leave efficiency standards to do the job alone ?

In fact, what is most important is the catalytic effect of the instrument, in other words the extent to which it can stimulate technological progress and create a sustained effort to improve energy efficiency. It should be borne in mind that the introduction of efficiency standards incites manufacturers to improve their products so as to comply with legislation, but it does not necessarily encourage them to develop new highly efficient products if they are not required to do so. To promote innovation, very stringent energy efficiency levels must be imposed, so that manufacturers will be compelled to innovate, or provision must be made for a gradual tightening up of regulations taking into account the improvements already made. But without additional incentives, the energy efficiency of appliances will improve slowly as a result of the general technical change movement. Manufacturers will have no problem opposing the introduction of new stringent standards by arguing that the new targets are not realistic from a technological point of view.

The advantage of labelling programs is not simply that they facilitate the introduction of standards by defining efficiency classes that can be used to determine the authorised efficiency levels. Labels also have a very important role in encouraging differentiation and are thus an incentive to technological progress. With minimum efficiency performance standards, most of manufacturers would simply ensure that their products were positioned beyond the authorized performance level. With labelling, manufacturers have the possibility of differentiating their appliances from standard products, something they can achieve through innovation and technological progress. This will gradually have an impact on all the appliances on the market and ultimately lead to higher efficiency standards. By stimulating the arrival of new more efficient products on the market, labelling schemes pave the way for progressively stricter efficiency levels and thus condition the effectiveness of regulations.

Of course, labelling schemes must be constantly reviewed if they are to remain a way of differentiating between products. If efficiency classes are not redefined regularly, the combined result of labelling and standards will be that most appliances will be positioned in the highest efficiency classes and it will be impossible to identify new appliances that are even more energy efficient. A labelling scheme which can evolve and which operates in conjunction with minimum performance levels that are periodically revised thus seems to be a particularly effective method and one that appears well suited to the transformation of the household appliance market.

The main disadvantage is that manufacturers in general are not very open to this type of approach, so that the effectiveness of programs can be limited by long delays and implementation problems. Negotiated agreements between manufacturers and public authorities can then be a more effective alternative to regulations.

6. VOLUNTARY AGREEMENTS: AN ALTERNATIVE TO REGULATIONS FOR IMPROVING ENERGY EFFICIENCY IN THE HOUSEHOLD APPLIANCE SECTOR?

The term voluntary agreements covers a diversity of measures undertaken by industrial players, either alone or in consultation with a public authority, to achieve certain environmental objectives. C. Carraro and F. Lévêque have distinguished three types of voluntary agreement according to whether the environmental objectives are defined by manufacturers, the public authority or both: unilateral commitments, public voluntary schemes and negotiated agreements (Carraro and Lévêque 1999 –Baecke *et alii* 1999). Here, we shall look only at the negotiated agreement, namely an agreement between a public authority and an industrial sector concerning a collective pollution abatement objective to be achieved by a specific date.

A recent overview of the literature has shown that the number of voluntary approaches of this type has increased significantly since the early 1990s and that negotiated agreements in particular have become very popular as an instrument of environmental policy (Baecke *et alii*, op.cit.). They are no longer limited to certain specific sectors such as waste management, electricity generation, or the high energy-consuming industries. Agreements have also been negotiated over the last few years in the home appliance sector, their aim being to improve the energy efficiency of domestic appliances.

Certain member States of the European Union and a large number of manufacturers prefer this type of negotiated agreement to regulatory measures, which they feel are too restrictive. Consequently, negotiated agreements have become increasingly accepted as a valuable alternative to regulations. The European Commission has negotiated agreements with manufacturers of televisions and video cassette recorders concerning power consumption in standby mode, as well as agreements with washing machine manufacturers (CCE, 2000). Two other agreements of the same type have recently been concluded for dishwashers and electric water heaters.

A highly effective method from a theoretical point of view

In theory, negotiated agreements have a number of features which, in certain specific situations, make them more effective as an economic tool than regulatory measures.

The ineffectiveness of regulations stems basically from the fact that it is impossible for public authorities to know the precise pollution abatement costs of each firm. It is thus impossible to impose different abatement objectives as a function of the particular situation of each firm. If a common objective is imposed on all the

industry players concerned, the marginal pollution abatement costs will be different for each company. This for the economist characterises an inefficient solution.

Public authorities find themselves faced with companies which are far better informed than they are about existing technical possibilities for improving energy efficiency and the costs of implementing them. It is in the interest of the firms to overestimate such costs to encourage the regulating authority to define a less restrictive overall abatement objective. Negotiated agreements operate in a different manner in that the distribution of the objectives among the different firms is left to the firms themselves. It is for example possible to allocate pollution abatement objectives among the firms, taking into account the technical possibilities and the implementation costs of each firm. Cost minimisation is reached if the allocation leads to the equalization of private marginal abatement costs; the distribution of objectives is then optimal (Glachant, 1999).

Distribution of effort among the different firms assumes that they are operating in a context which encourages them to co-operate with one another. This operates in a context of general uncertainty (no one firm has more information than any of the others) and for a relatively homogeneous business sector (*ibid*). All the firms are in the same situation of uncertainty concerning available techniques and related costs, and are more encouraged to co-operate with one another to make up for the lack of information (Defeuilley 2000). Negotiations between firms imposed by a voluntary commitment for a given sector thus contribute to a collective learning process that benefits each individual firm: "When using Vas, intense collective learning improves information of the firms and allows them to implement their private pollution abatement objectives at lower cost" (Glachant, 1999).

To sum up, the regulatory approach is handicapped by the uneven distribution of information between the regulating authority and the firms, resulting in the assignment of the same environmental objectives to all the players, with the consequent risk of setting these targets too low in order to take into account the firms that pollute the most. On the other hand, in the case of negotiated agreements, the firms negotiate among themselves and choose abatement levels which take into account their own capabilities. Burden sharing is not necessarily optimal but the principle of negotiating individual commitments introduces a certain flexibility which the regulatory approach does not have.

Finally, negotiated agreements in a context of general uncertainty among firms where individual situations are much the same contribute to a collective learning process. This approach makes it possible to share the costs of acquiring information on pollution abatement techniques and ultimately reduces the costs of achieving the objectives.

Concrete advantages compared with government regulations

In addition to the theoretical advantages of voluntary agreements in terms of economic effectiveness, negotiated agreements offer companies a number of concrete advantages compared with government regulations.

The first such advantage is that companies enter into a process of negotiation with the public authorities which enables them to participate directly in defining the objectives and the target dates for implementation. It is true that public authorities may also consult industry when drawing up regulations, but it is the regulating body that has the final word. In the case of negotiated agreements, manufacturers and public authorities define the objectives together. This approach is also more flexible than regulations since the objectives or deadlines for reaching the goals can differ according to the individual capabilities of the companies or to take into account particular market configurations. As a consequence, the principal advantage of negotiated agreements is that they remove or defer the threat of government regulations which companies consider to be too restrictive and upsetting for the markets.

Positives incentives also help to encourage manufacturers to adopt voluntary approaches. The collective learning process mentioned above can help manufacturers identify novel technological solutions. Similarly, when companies sign a voluntary agreement to reduce industrial pollution their public image can be enhanced. Finally, a voluntary approach can stimulate a strong interest within the company in achieving the environmental objectives, something which government regulations cannot do.

For their part, public authorities consider voluntary agreements to be an alternative approach which enables the same environmental objectives to be reached in a shorter time and at a lower cost than in the case of regulations.

In cases where public authorities do not have as much information as the companies regarding technologies and implementation costs, negotiating with the companies provides the authorities with the opportunity to obtain a minimum of such information. The commitment of manufacturers and the co-operative approach also speed up the process of defining the objectives. Finally, the fact that the agreements are partially self-monitored by the participating companies limits public administration and monitoring costs.

Problems of implementing negotiated agreements should not be neglected (a participation of a large majority of manufacturers operating on the market is required to avoid free-riding behaviour for example) but when basis conditions are satisfied, such agreements can constitute a positive measure both for the participating companies and for the public authority. However, the question of their environmental impact must be considered: are the objectives negotiated by companies really achieved, and can any improvements observed be clearly attributed to the voluntary agreements?

Generally positive results which cannot be attributed solely to voluntary agreements

Generally speaking, the objectives defined in negotiated agreements have been achieved. However, it is difficult to maintain that these results are due solely to the effects of the agreements, since such agreements are quite often used in conjunction with other instruments.

In a study to determine the environmental impact of six negotiated agreements in different sectors, the European Environment Agency concluded that it was very difficult to attribute the observed improvements in environmental quality to the negotiated agreements alone (EEA 1997). A more recent study carried out on behalf of the European Commission is more positive regarding the impact of agreements in the field of energy efficiency improvements. The five programmes examined were successful in reaching the proposed objectives and the voluntary agreements appeared to contribute to a gradual improvement of the energy-efficiency performance in firms – especially those without elaborated energy management practices (Krarup and Ramesohl, 2000). The authors point out, however, that "the agreements schemes like other instruments appeared to induce only minor additional effects if not combined with specific policy instruments ..." (*ibid*).

As far as specific negotiated agreements to reduce the energy consumption of household appliances are concerned, the results observed are decidedly positive. The first annual report on the agreement concerning televisions and video cassette recorders indicates that the energy efficiency improvement objective defined in the agreement should be reached, and even exceeded within the defined time limit. Similarly, the results obtained under the agreement made between the European Commission and European Committee of Manufacturers of Domestic Equipment (CECED) to reduce the energy consumption of washing machines are well in line with the commitments that were made.

In this agreement approved in December 1998, manufacturers agreed:

- To improve the energy efficiency of washing machines sold in the European Union: overall reduction in energy consumption of 20% for the period 1994-2000,
- To gradually cease production and import of the least energy efficient models (energy label classes D – partially- E, F and G) in two stages (Dec. 1997 and Dec. 1999),
- To provide consumers with information on energy efficiency, conduct research programmes on low temperature washing techniques, and co-operate closely with detergent manufacturers.

The average energy efficiency improvement of 20% for the period 1994-2000 corresponds to an objective of 0.24 kWh/kg by 2000, which was achieved before the deadline since the average energy efficiency observed in 1999 was 0.228 kWh/kg (CECED, 2000). Similarly, the distribution of models by energy efficiency classes at the end of 1999 showed that classes D, E, F and G had been completely eliminated, as agreed by the manufacturers – except for the small models or those with low spin speeds which were permitted in class D under the terms of the agreement (*ibid*). Overall, more than 1100 models, representing 40% of the total, were withdrawn from the market between 1995 and the end of 1999.

The question as to the effectiveness of negotiated agreements in the household appliance sector must therefore be approached from a wider angle than simply whether or not the proposed objectives can be reached. While there seems to be no doubt as to this aspect, the economic and environmental effectiveness of such agreements should be examined in more detail.

How effective are negotiated agreements in the household appliance sector ?

One of the factors which makes negotiated agreements particularly effective compared with regulatory measures is their flexibility, which enables the efforts for improvement to be divided to a certain extent among the different firms. This differentiation of objectives is particularly useful where a common objective for all companies would result in considerably different implementation costs for each one. What is the situation in the household appliance sector?

Washing machine manufacturers do not all have the same opportunities to enhance the energy efficiency of their products⁷: i) certain companies have skills and expertise that others do not ii) the additional costs can be more easily passed on to the consumer through purchase prices in the case of manufacturers of high-end products iii) manufacturers whose main markets are traditionally more environmentally aware (northern Europe, for example) will find it easier to sell more energy efficient products than those manufacturers whose markets are less attuned to environmental issues⁸. For example, if all the machines sold in the European Community were required to have a weighted mean energy consumption of 0.23 kWh/kg, the estimated price increase would be between 1 and 2% in northern Europe and between 8 and 14% in southern Europe and the United Kingdom where the proportion of machines in classes D and G is highest (CEC, 2000). Washing machine manufacturers are thus faced with different costs for improving energy efficiency, which may justify a differentiation of their individual objectives.

Nevertheless, in the negotiated agreement, no differentiation in objectives among washing machines manufacturers was apparent (unless such inter-company negotiations were not made public). Each manufacturer agreed to the same targets: average improvement in sales weighted energy efficiency and elimination of classes D, E, F and G. It could not be otherwise.

Obviously, the assignment of abatement efforts among the different firms assumes a clear commitment to co-operation, which will be difficult to obtain in a context of strong competition (Defeuilley 2000). Consequently, as Borkey and Glachant point out, it is difficult to imagine that a firm whose pollution abatement costs are low will make additional efforts to reduce pollution so as to save a competitor from having to take more costly measures. Co-operation is mutually profitable to firms when there is general uncertainty regarding available techniques and associated costs, and in a sector of activity which is fairly homogeneous. However, when environmental considerations are an important competitive argument, why should a firm share with a competitor strategic information on the technological opportunities for improving energy efficiency ?

Thus, competition remains a major obstacle to an efficient allocation of pollution abatement efforts among firms (Defeuilley, 2000). In the household appliances sector, competition is very keen and is increasingly becoming a factor of differentiation between firms. In such conditions, negotiations between firms are unlikely to lead to an allocation of effort which takes into account the particular situation of each firm.

Why then have manufacturers been in favour of a voluntary approach when they seem to be committed to respecting objectives which appear similar to those which would have been imposed by a regulatory authority ? Undoubtedly to defer the threat of legislation which would probably not have allowed them the same flexibility. Concerns about their public image, interest in a collective learning process, and the prospect of sharing certain costs have encouraged firms to negotiate agreements, but the main incentive has been the desire to avoid the increasing threat of regulatory measures being imposed. As the power of negotiation has then been largely in the hands of the public authority (here the European Commission), it could impose an efficiency level very close to that which would have been obtained through regulations.

This point is essential. The level of constraint imposed, and thus the type of incentive to be offered to firms, depends on the respective powers of the companies and the public authority. A very restrictive requirement may result in strict objectives which are likely to force firms to make real additional efforts while, on the other hand, less restrictive objectives would leave most of the negotiating power in the hands of the firms, with the consequent risk of accepting commitments which are not very different from general market trends (Segerson and Micely 1997).

The effectiveness of negotiated agreements therefore depends on two factors. In the first phase, when the objectives are defined, it is the credibility of legislative threats which determines the level of the commitments undertaken and the environmental effectiveness of the measures. Then, in the implementation phase, an

important factor is whether information is equally shared among the different firms, as this will determine their interest in adopting a collective learning approach and govern its economic effectiveness. With respect to the negotiated agreements on washing machines, the legislative threat had become more real with the considerable preparatory work already carried out by the public authorities and led to the adoption of relatively restrictive commitments and a certain positive effect on the environment. On the other hand, it is more difficult to judge how effective it has been from an economic point of view, since the pressure of competition has certainly limited the collective learning process, the possibility of sharing the burden among the participants, and some of the potential benefits of a voluntary approach.

7. CONCLUSION : NEGOTIATED AGREEMENTS ARE EFFECTIVE INSTRUMENTS FOR TRANSFORMING THE MARKET IN SPECIFIC CONTEXTS BUT NOT A GENERAL ALTERNATIVE TO THE REGULATORY APPROACH

In the field of household electrical appliances (in the most general sense of the term), the limited sensitivity of consumers to the energy price signal considerably restricts the effectiveness of certain instruments designed to improve energy efficiency. The traditional means employed to inform consumers and enhance their awareness of energy efficiency issues, as well as economic measures (energy taxes), are generally insufficient to stimulate demand and bring about a real improvement in efficiency levels. The regulatory approach, with the introduction of minimum performance standards for all available appliances, in conjunction with energy labelling schemes, has thus proved its effectiveness, particularly in stimulating a process of technological change.

On account of the opposition it raises from the manufacturers, however, the regulatory approach assumes a strong commitment on the part of the public authorities, deploys considerable resources (preparation, monitoring), and may require considerable time for implementation. The voluntary approach may then constitute an interesting alternative to regulatory measures, being easier to implement since it is more flexible as well as being just as effective from an environmental standpoint. Are necessary conditions present here for the negotiated agreement to represent a real alternative to the regulatory approach?

To reply to this question, several factors must be taken into account. The first concerns the level of the commitments undertaken by the manufacturers and the reality of the claimed additional efforts compared with the general trend in energy efficiency improvement. The example of washing machines showed that ambitious targets could be negotiated when the bargaining power was in the hands of the public authority, that is, when the prospect of future regulatory measures constituted a real, credible threat. The credibility of such a threat depends directly on the information the public authority has regarding the firms' room for manoeuvre, the technological opportunities available and the implementation costs. "Profound analyses and preparation are needed for ambitious target setting" (Krarup and Ramesohl, 2000). This also means that negotiated agreements do not necessarily require shorter implementation periods or lower preparation costs than those associated with the regulatory approach.

The second point concerns the distribution of effort between the firms and, more generally, the effectiveness of the voluntary approach. Theoretical analysis shows that when there is considerable information asymmetry among firms, they are less inclined to co-operate with one another. In such cases, certain firms can even act in such a way as to encourage adoption of the regulatory approach if they consider that it would strengthen their competitive advantage (Aggeri and Hatchuel, 1996). The presence, or absence, of shared uncertainty regarding technical solutions and implementation costs determines in part the instrument to use. If the technology to be used is uncertain for all the firms, it is preferable to opt for a collective learning solution which would enable the sharing of certain costs (acquisition, processing of information). If, on the other hand, certain firms have a technological advantage over their direct competitors, it is preferable that the public authority favours a differentiation strategy which would encourage the leaders to preserve their technological edge and the less advanced firms to try to close the gap. The voluntary approach cannot therefore be considered as a systematic alternative to minimum efficiency standards, without first analysing the competitive structure of the market and the technological prospects of the different firms.

Finally, the effectiveness of voluntary agreements must be analysed from a dynamic standpoint. In the regulatory approach, the gradual tightening up of existing standards imposed by the public authorities is essential to set in motion a process of energy efficiency improvements. Can such a progressive tightening up of commitments be envisaged in the case of a negotiated approach? Yes, on condition that the legislative threat remains credible. But

the regulatory approach and voluntary agreements must not then be presented as alternatives, as there is a risk of regulatory measures losing their impact if the negotiated agreement option is momentarily given preference.

To conclude, it seems to us that the negotiated agreement constitutes a complementary approach to that of regulatory measures and one which can be used in certain cases because of its greater flexibility. However, at the same time, the possibility of introducing efficiency performance standards will have to remain permanent and credible to encourage companies to renegotiate more restrictive targets and to stimulate a process of steady improvements in energy efficiency. The conditions for renegotiating the first negotiated agreements when they expire will provide an indication of the bargaining power of the public authority. If negotiated agreements become the standard approach, the threat of the introduction of regulations will appear less credible, and negotiated agreements less effective than efficiency standards in transforming the household electrical appliance market.

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9. END NOTES

¹ Non-thermal uses or captive uses of electricity will be used thereafter to refer to household appliances, lighting and home electronics uses of electricity.

² These figures result from a statistical analysis based on the national households electricity consumption, housing surface, households equipment, time of use, etc.

³ The GIFAM (Union of French manufacturers of household appliances) drew attention to the fact that between the beginning of the 1970s and the early 1990s, the electricity consumption of domestic cold appliances decreased by 40% and over the same period the average power consumption of washing machines fell from 3.4 kWh to 1.7 kWh for a long wash program (GIFAM, 1994).

⁴ According to ECU's report on UK cold market transformation, only 13% of UK consumers considered energy consumption as an important criteria when choosing a refrigerator, after size (16%), reliability (20%) and price (33%) (ECU, 1997).

⁵ Recent surveys indicate that consumer preferences are slowly evolving as a result of the introduction of labelling and related advertising campaigns in favor of energy efficiency (Ademe – Sofres, 1999).

⁶ Typical annual consumptions for average refrigerators / freezers (370 l adjusted volume) in A, B and C classes are respectively 280 kWh, 360 kWh and 460 kWh.

⁷ In 1997, between 10 and 11% of washing machines sold in the EC were in classes D to G. In the case of a few major manufacturers, these machines represented over one third of their product range (CEC, 2000).

⁸ If all the machines sold in the EC were required to have a weighted mean energy consumption of 0.23 kWh/kg, the estimated price increase would be between 1 and 2% in northern Europe and between 8 and 14% in southern Europe and the United Kingdom where the proportion of machines in classes D and G is highest (CEC, 2000)