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Improving appliance efficiency: International experience, South African prospects

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ENERGY & DEVELOPMENT RESEARCH CENTRE
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Executive summary

1 Introduction

This report assesses and reviews international experience and local issues affecting appliance efficiency. It forms part of a research programme entitled, *Energy efficiency, equity and the environment: Improving access to energy services for the urban poor of South Africa*. The programme is supported by the International Development Research Centre (IDRC) of Canada, and Eskom.

Improving appliance efficiency is a strategy that should form part of an integrated household energy programme in South Africa. The biggest challenge for the energy sector in South Africa is to utilise the unique opportunities provided by the government's Reconstruction and Development Programme (RDP). The RDP housing and electrification programmes provide a 'window of opportunity' to introduce efficient appliances into the domestic market.

As houses are built and electrified, the uptake of appliances will see sharp increases. If this opportunity is used effectively to manufacture or import more efficient appliances, energy costs to users and suppliers could be significantly reduced, and environmental sustainability promoted. It also offers an opportunity to control the influx of inefficient appliances to millions of households in the South African market.

In line with the drafting of an Energy Policy White Paper, appliance energy efficiency has been proposed as a policy option for saving energy in households. It is essential, therefore, that South Africa identify and learn from other countries' experiences and gauge the prospects for improving energy efficiency of appliances.

2 International review

In both developed and developing countries appliance standards and appliance labelling have been used as strategies to improve the energy efficiency of appliances. Together, they are a double-edged marketing strategy to encourage the manufacture and purchase of more efficient appliances.

2.1 Appliance standards

Appliance standards are used as a tool to influence manufacturers to produce appliances that meet or exceed a certain level of energy efficiency. Their major effect is to eliminate inefficient appliances from the market.

According to international experience, energy efficiency standards are established on the basis of technical, engineering, economic and environmental analyses. The technical and engineering analyses look at design options that include insulation, gaskets, compressors, and so on, input costs, efficiencies and other components of the analysis. The economic analyses consider economic principles which should be adhered to in setting the standards and often includes a life-cycle cost analysis. The economic analyses also have to calculate the payback periods to consumers and manufacturers. Environmental analyses look at the least societal cost and this incorporates an assessment of the value of preventing and reducing emissions.

Standards need to be set or enacted three years in advance of the date at which they become effective (McMahon et al 1990: 7.108), giving manufacturers sufficient time to make necessary changes. For standards to be effective they need either to be enforced by government, or voluntary compliance can be sought. There are two stages of enforcement: (1) initial model certification; and (2) inspection at the point of retailing. Public institutions should generally enforce standards, but there is scope for the participation of consumers and the public at large. Institutional mechanisms have to be strong enough to support the enforcement of standards. Lack of agreement and weak enforcement mechanisms have been serious impediments to the effectiveness of past efforts to improve the efficiency of consumer appliances (World Bank 1993:63).

Positive effects	*Negative effects*
Standards eliminate energy inefficient appliances from the market	Standards are difficult to design and to gain acceptance, particularly from manufacturers
If applied in association with incentives they encourage progressive efficiency improvements	They are inflexible and difficult to change
They affect the financial status of appliance manufacturers and consumers by reducing energy bills and operating costs and raising profits for manufacturers	Due to changes that have to be made in design and production lines, standards affect the financial status of appliance manufacturers and consumers by raising costs as changes are made
They contribute to the reduction of ozone depleting substances and greenhouse gas emissions	They have the potential to restrict trade amongst countries (unless they can be harmonised)

Positive and negative effects of appliance standards

Appliance standards can either be mandatory or voluntary. Mandatory efficiency standards represent the easiest and most reliable method of increasing energy efficiency (Robinson 1991:639). Mandatory standards are written into legislation (Nadel 1994). Such standards include minimum efficiency standards (MES) or minimum energy performance standards (MEPS) (Harrington 1994:1).

Voluntary standards are normally set as goals for improvement rather than as a minimum level to be attained. Generally, government, together with the manufacturers in some cases, sets goals and the manufacturers respond voluntarily.

Voluntary standards	*Mandatory standards*
Can encourage manufacturers to further improve the efficiency of appliances above the floor level set in order to avoid regulation	Provide little incentive for further improvement once they are complied with; they tend to become ceilings as well as floors for energy efficiency
Voluntary compliance	Can use voluntary compliance at first but if all fails, then consider enforcement
Cannot deal effectively with the dumping of sub-standard imports	Effective for dealing with sub-standard imports
Difficult to monitor and enforce compliance and to set targets	Easier to enforce and monitor compliance
More effective in a cohesive appliance industry where the playing field is levelled	Can be effective in a fragmented industry where the playing field is not levelled

Comparison of voluntary and mandatory standards

2.2 Appliance labelling

Appliance labelling can provide consumers with information on the relative efficiency of comparable models of the same appliance. It aids in comparing the energy efficiencies and the estimated annual operating costs of competing brands and models of appliances, and involves displaying or affixing a label (tag or sticker) to an appliance.

The label contains various types of information. The content differs for different appliances. The most common type of information ranges from annual energy consumption, the energy efficiency rating (in the form of a bar scale for different models), energy usage in kWh of electricity, annual energy operating costs, or a combination of all this information.

Like standards, appliance labelling can be either mandatory or voluntary. Labelling is made mandatory through legislation and regulations which give force to the relevant standards and outline the requirements of the labels. Mandatory labelling forces the manufacturer, importer, and distributor to display labels that indicate the energy performance of appliances.

Two types of labelling programmes are known as *'endorsement'* and *'comparison'* labelling (Casey-McCabe & Harris 1995). Endorsement labelling helps consumers distinguish and compare

similar products by providing the buyer with a single 'seal of approval' for products that meet or exceed specified energy efficiency standards. Comparison labelling, on the other hand, tries to provide consumers with information on all or most of the models within a given appliance category so that they can compare the energy efficiency among similar products.

International experience has shown that appliance labelling has had various effects on consumers' buying habits and manufacturers' capability and interest in producing efficient appliances. It is clear that labelling alone does not promote the production and purchase of efficient appliances: other measures such as technological developments, regulatory policy and incentives appear to play an important role in increased appliance efficiency.

Testing and certification programmes are vital to certify the accuracy of claims for appliances' operating efficiency as shown on their labels, and the design of a testing programme is consequently important. Again, testing and certification can be either voluntary or mandatory. Mandatory testing requires that the appliance be tested according to the energy efficiency standards and be certified (with a verification mark, in some cases) to indicate that the appliance meets the energy efficiency requirements. A government or independent testing facility must be available to test and certify the operating efficiency of appliances.

2.3 Barriers to improving and developing efficient appliances

Barriers to improving appliance efficiency are to a very large extent common to the ones that inhibit increasing energy efficiency. In most countries consumers are not very interested in energy efficiency. They tend to consider the first cost of the appliance and non-energy features (size, physical appearance of the appliance, etc.) as having a higher priority than the energy operating costs of the appliance. Manufacturers therefore tend to focus on keeping their costs low and fail to consider energy efficiency, as there is little incentive for this (Meyers et al 1990: 8-1).

The barriers to improving the efficiency of appliances include:

- lack of consumer interest because of low electricity prices;
- lack of utility support and common vision;
- low value attached to energy savings;
- lack of information on energy efficient appliances, their current availability, their energy performance and savings from efficient appliances;
- affordability barriers as a result of high first costs;
- absence of efficient technologies and products on the market;
- manufacturers' resistance to the introduction of efficiency standards on the grounds that they would reduce consumer choice;
- separation of responsibilities for capital investment and payment of operating costs (Simmonds 1995);
- marketing and pricing strategies that promote energy features other than efficiency performance;
- the importation of higher efficiency components and modification of manufacturing facilities which in most cases require huge capital availability;
- tariff barriers or high import duties that can inhibit the importation of efficient appliances or components thereof;
- lack of communication and co-operation amongst government departments;
- insufficient local R&D conducted on new efficient appliances; and
- lack of government commitment and a policy framework to implement energy efficiency programmes (Meyers et al 1990:8-1, 8-4, McMahon 1991).

3 Local experience with appliance efficiency

The South African Bureau of Standards (SABS) is the responsible authority for facilitating and issuing national standards, specifications, codes of practice and standard methods. The SABS can also amend and withdraw standards. It acts as the co-ordinator or facilitator amongst various

stakeholders in developing and updating standards. SABS standards are developed by technical committees comprising the SABS, technical experts, manufacturers and consumers. The committees are responsible for writing performance specifications falling within its scope of work.

The SABS has compulsory specifications for safety and health. It has various marks which denote that the product is of good quality and has complied with respective specifications. The SABS marks cover safety, approved performance, environment, packaging, and specialised certification marks. These marks act as endorsements; they have recently been reviewed and new marks have been developed (SABS Bulletin 1995:6).

South African appliance standards are yet to address the energy performance of appliances. Standards for refrigerators and water heating attempt to address this issue but require further development.

Appliance labelling still has to be introduced in South Africa as South African appliances do not display information about energy performance. It is expected that this may change in future, however, in the light of the DMEA's interest in and support for appliance labelling initiatives. The SABS is a well equipped testing facility which can potentially test the energy performance of even major appliances.

4 The South African appliance industry

The South African appliance industry is made up of manufacturers, importers, distributors and retailers. The industry is currently in crisis. The key problems range from an influx of illegal imports, dumping of sub-standard appliances, poor performance of South African products in international markets and the lack of investment incentives as result of technological backwardness, costly components and the recent devaluation of the Rand.

In the past five years the industry has not performed well. The Department of Trade and Industry is currently undertaking cluster studies to develop strategies for making industry more competitive and able to contribute to economic growth. The industry also faces increased competition from foreign companies as result of the WTO (formerly GATT) agreement requiring the reduction and phase-out of import tariffs.

South African manufacturers produce, assemble and import appliances and components thereof. Growth in appliance sales between the 1980s and the 1990s has been in consumer electronics and white goods, with the former showing the stronger growth, in particular video recorders, audio equipment, colour TVs, refrigerators and electric stoves in particular. There has also been growth in small appliances (especially hotplates, irons and kettles) but not to any great extent.

Sales have been forecast 'to go through the roof' from an annual figure of R4-billion to R10-billion within the next five years. The big three appliances with the highest sales penetration are TV sets, refrigerators and stoves, which will make up over 80% of total appliance sales.

It is evident that between 1990 and 1991 sales to black households increased by over 18%, compared to the 2.3% increase in the white market (Baumann 1995: 21). This signifies the entry of black households as new clients to the appliance industry.

5 Current trade in energy appliances to and from South Africa

Trade in electrical appliances is governed by *ad valorem* duties, surcharges, excise duties, formula duties and special rates of duty (Baumann 1995: 87). These features of tariff protection apply to all imported finished products and components of the product. Taxes on imported electrical goods range from 20 to over 90%. In line with the WTO agreements, however, the Department of Trade and Industry has initiated an intensive programme of reducing an eventually phasing out tariff duties. The duties will be phased out over a period of five years to adhere to the 0 to 30% ceiling.

In order to encourage local firms to increase exports, the General Export Incentive Scheme (GEIS) was introduced in the early 1990s and resulted in the stimulation of exports (Baumann 1995: 103). Appliance manufacturing firms have confirmed that exporting would not have been viable for them had it not been for the GEIS. After intensive discussions in the National Economic Forum (now NEDLAC) the GEIS was reviewed and it was decided to develop a revised GEIS which

entails a phased reduction of the GEIS benefit levels, the elimination of certain structural imbalances and the eventual termination of the scheme by 31 December 1997.

The balance of trade for household appliances is uneven, with imports far exceeding exports. The trade balance in most cases for particular products is strongly negative with exports not exceeding 30% of imports (Baumann 1995: 89). In 1990 out of the 30 consumer electronics markets, South Africa was the 22nd largest producer and 21st largest consumer (Baumann 1995). This makes South Africa an important player in the global consumer electronics markets.

Exports have grown in recent years in white goods and consumer electronics, mainly to Africa and Europe. Imports have also grown at a faster rate than exports. South Africa imports built-up or completely finished units and components of finished products, particularly in consumer electronics. Between 1988 and 1991 the composition of imports of household appliances has shifted from 62% for domestic appliances to 48% and from 38% of consumer electronics to 52% (Baumann 1995:94). Imports for consumer electronics have been the highest followed by white goods and small appliances.

6 Strategies to improve the energy efficiency of refrigerators, hot water heaters and lighting technologies

Refrigeration, water heating and lighting technologies offer opportunities for saving energy. The RDP housing and electrification drive also offers an opportunity to transform the market of these appliances by manufacturing more efficient ones. Refrigerators are one of the first large appliances acquired by households and they consume 12% of domestic electricity. Water heating is a basic energy service in poor households. It is the primary energy consuming activity and it accounts for some 30-50% of the total household load. In most high- to mid-income houses geysers are installed as part of housing delivery by developers. Lighting is normally the first energy service accessed by households. The market for these technologies is in place and efficiency gains need to be pursued.

A number of strategies are summarised below, representing key requirements for effective appliance efficiency improvements:

- commitment and support from government;
- R&D, demonstration and dissemination;
- support from utilities;
- minimum efficiency standards (MES) combined with energy labelling;
- financial incentives and assistance;
- technology procurement / bulk buying by government;
- promotion and media campaigns;
- human resource development and training;
- stakeholder advise group.

These strategies should be addressed in a complementary manner and should not be looked at in isolation to each other.

7 Conclusion

Appliance standards and labelling are essential tools for improving the energy efficiency of appliances. However, appliance efficiency initiatives need to combine appliance standards, labelling, financial incentives, and technical assistance. A combination of these would yield the greatest savings and participation levels. South African manufacturers can potentially benefit from improved appliance efficiency, enhancing their ability to be more competitive internationally, and helping them to tap domestic and export markets. Government's major policy challenge in this regard, is to ensure that domestic manufacturers and distributors are able to produce, market and distribute efficient appliances. The key issue for improvement in appliance energy efficiency is good co-operation amongst the various stakeholders.

1
Introduction

1.1 Appliance efficiency

Appliance efficiency in South Africa has a small yet important role to play in sustainable development. The manufacture and use of efficient appliances can reduce energy consumption, which will save resources for consumers and also reduce negative the environmental effects of energy use.

The biggest challenge for the energy sector in South Africa is to utilise the unique opportunities provided by the government's Reconstruction and Development Programme, which plans to increase access of the urban and rural poor to electricity and housing services. The building and electrification of low-income households should result in a sharp increase in the uptake of appliances. If this opportunity is used effectively to manufacture or import more efficient appliances, energy costs to users and suppliers could be significantly reduced, and environmental sustainability promoted. It is also an opportunity to control the introduction of inefficient appliances to millions of low income households.

South Africa has entered an era in which its energy policy is being redrafted to fall in line with the new policy objectives of the Government of National Unity. The *South African Energy Policy Discussion Document* has identified appliance energy efficiency as a key issue.

Factors that offer opportunities for improving the energy efficiency of household appliances in South Africa include:

- the current restructuring of the appliance industry;
- a new emphasis on social equity in South Africa resulting in investment in energy service provision to low-income household;
- new emerging markets of mainly uninformed consumers (first time buyers, mostly black households); and
- pressures to protect the local economy from the dumping of sub-standard household appliances.

1.2 Purpose of report

This report assesses and reviews current issues affecting appliance efficiency both internationally and locally. It forms part of a research programme entitled '*Energy efficiency, equity and the environment: Improving access to energy services for the urban poor of South Africa*' (the 'E4' project), which is supported jointly by the International Development Research Centre (IDRC) of Canada, and Eskom.

This report focuses specifically on *electrical* appliances, as these appliances offer huge opportunities for energy efficiency savings. Following the accelerated electrification drive, most households are purchasing electrical appliances. It has been forecast that the electrification drive is expected to increase sales of appliances from a current annual figure of R4-billion to R10-billion within the next five years (*Engineering News*, April 1995). Appliances will have high penetration levels in electrified households.

1.3 Report outline

There are seven sections to this report. Chapter 2 reviews international and local literature on appliance standards and labelling. Since South African research in this area is quite limited and recent, lessons can also be learnt from other countries with regard to appliance standards and labelling. Chapter 3 looks at current trends in the South African appliance industry: the current structure of the industry, and problems within it; its importance to the national economy; and the roles of consumers and trade unions. In Chapter 4 the current trade in household appliances to and from South Africa is described, providing an overview of the South Africa trade sector which can help in assessing the potential future role for South African manufacturers in either export or import markets. A review of trade is also essential in relation to issues around the

dumping of substandard imported appliances. Chapter 5 considers financial mechanisms linked to international environmental protocols and conventions, and whether these can be accessed for appliance efficiency improvements. Chapter 6 examines the strategies which can be considered for improving the energy efficiency of refrigerators, water heaters and lighting technologies in South Africa. Chapter 7 draws out the main conclusions.

2
A review of the literature

2.1 Introduction

The literature generally distinguishes between appliance standards and appliance labelling. Appliance standards are defined by Geller (1990) as a tool that can help stimulate efficiency gains by prescribing the energy performance for appliances. Appliance standards are used to influence or encourage manufacturers to produce more efficient appliances that meet minimum energy standards. Appliance labelling, on the other hand, is used as a means of informing users about the efficiency of the appliance. It is a double-edged marketing strategy to encourage the purchase of efficient appliances and also encourage manufacturers to produce more efficient products – no manufacturer would want to acquire a reputation for producing inefficient appliances. Where standards are mandatory and enforced, inefficient appliances are removed from retail sales points.

This chapter reviews local and international experience, looking specifically at appliance standards and labelling. The international component will identify lessons, while the review of local experience will assist in understanding the current status of appliance standards and labelling in South Africa.

2.2 International experience

The international literature centres on developed countries: Canada, Australia, Germany, Netherlands, USA, Britain, France, Denmark, Japan and Switzerland. Developing countries or newly industrialised countries also mentioned include Brazil, South Korea, Malaysia, Indonesia and Thailand. Only one article reviewed dealt with an African country, in this case, Kenya. The most common energy source covered in the literature is electricity; gas and fuelwood are examined, but not to a large extent.

2.2.1 Common issues emerging from the literature

The most common issues to emerge from the literature are the following:

2.2.1.1 Government's role and involvement

In some countries, including Korea, Japan and the USA, governments have played an important role in convincing the industry and other stakeholders to improve energy efficiency, especially in instances where there were market failures. The government's role in an appliance efficiency programme would be to encourage appliance manufacturers to produce, and users to purchase, efficient appliances.

This is sometimes attempted through technology procurement programmes. These involve initiating and accelerating the development or manufacture of efficient appliances by ensuring or guaranteeing a market for them. A government can use its buying power to buy efficient appliances and therefore stimulate demand for them. Through procurement programmes the government can help overcome market imperfections that inhibit the manufacture, purchase (usage) and distribution of efficient appliances.

The other role that the government can play is to encourage manufacturers to give consideration to the energy efficiency of products especially when designing new manufacturing facilities. The government can set goals or legislate standards and labelling guidelines.

In many countries the government has promoted the formation of consortiums that are made up of different stakeholders. Governments also disburse funds to support research, development and demonstrations.

According to Simmonds (1995) the government can also remove any constraints on utilities to implement demand-side management (DSM) programmes and also improve the effectiveness of market forces by ensuring that energy users have access to adequate information and advice. Thus governments can potentially facilitate the following activities:

- regulation for setting standards and labelling guidelines;

- information generation and dissemination; and
- economic and market intervention (Simmonds 1995).

2.2.1.2 *Utility and private sector involvement*

In the USA utilities have been involved in appliance efficiency through DSM programmes. Most utilities in the USA have implemented DSM as an energy service. Utilities' involvement in the provision of financial incentives like rebates, technology procurement programmes and so on have boosted the purchase of efficient appliances as well as ensuring that a market exists for manufacturers. The USA's Super Efficient Refrigerator Programme (SERP) and Swedish NUTEK's 'golden carrot' type programmes are good examples of procurement programmes. In the USA and Sweden the energy utilities announced a competition for the most efficient refrigerator. This encouraged appliance manufacturers to produce the most efficient freezer or refrigerator as the winner was guaranteed a large order (at least 500 refrigerators in the NUTEK programme). The purchasers were also encouraged by a subsidy of SEK 1,000 per refrigerator. (Turiel et al 1995: 3-2).

Fourteen utilities in the USA implemented DSM bidding programmes in mid-1991. Roughly 250 MW of DSM has been contracted with Energy Service Companies (ESCOs). ESCOs are important role-players, which offer a way of tapping into the market for efficiency programmes. They fit particularly well in an environment in which utilities are pursuing DSM and integrated resource planning (Levine et al 1992: 80). They also represent a means of strengthening private sector involvement in DSM, and generally work with utilities when DSM is pursued. ESCOs provide 'one-stop shops' of services, from identification of energy efficiency needs through implementation and subsequent maintenance and monitoring (Philips 1991). They are common in North America, Europe, India and Thailand. When ESCOs offer a performance contracting programme they contract to assume responsibility for the energy services at a facility at a certain cost that is proportionate to the facility's energy bills. The contracts are based on projected energy savings performance, and they draw their profits from those energy savings (Phillips 1991: 30). Appliances can be purchased through ESCOs and their performance contracting programmes.

2.2.1.3 *Appliance selection criteria and common appliances*

In most countries appliances selected for labelling and standards are those which contribute most to peak demand and those with high operating costs. Appliances most commonly mentioned in the literature are refrigerators, air-conditioners, water-heaters, lighting, clothes-washers and dish-washers; on the other hand, television sets, videos and irons are only infrequently referred to.

2.2.1.4 *Use of legislation*

Energy efficiency, energy policy and conservation acts have been passed in many countries, including Canada, USA, and Australia. Such acts provide for the regulation of minimum efficiency standards for energy-using equipment, including household appliances. Legislation in some countries also addresses labelling at the point of sale. Regulation in most countries is helpful in addressing market malfunctions, especially with adherence to and enforcement of standards and labelling.

2.2.1.5 *Consultation/ negotiation process*

In many countries (Canada, Australia), consultation and negotiation amongst stakeholders ranging from appliance manufacturers to consumer and environmental groups and others, has contributed immensely to the success of the labelling programmes, and has also helped programmes to develop rapidly and harmoniously (Harrington 1994: 4).

2.2.2 Appliance standards

Standards define test procedures and conditions for the measurement of energy consumption of appliances and set criteria for a minimum performance level (Harrington 1994). Different types of standards address aspects such as health, safety, noise emissions, smoke, cleanliness, and various aspects of performance including energy efficiency. Energy efficiency standards are used as a tool to influence manufacturers to produce appliances that meet or exceed a certain level of energy efficiency. The major effect is to eliminate energy-inefficient appliances from the market.

According to international experience energy efficiency standards are established on the basis of technical, engineering, economic and environmental analyses. The technical and engineering analyses look at design options that include insulation, gaskets, compressors, manufacturers' costs, efficiencies and other components. The economic analyses consider economic principles which should be adhered to in setting the standards and life-cycle cost analysis. The economic analyses also have to calculate the payback periods to consumers and manufacturers. Environmental analyses look at the least societal cost and this incorporates an assessment of the value of preventing and reducing the emission pollutants.

According to one author, standards should be set or enacted three years in advance of the date at which they become effective (McMahon et al 1990: 7.108), giving manufacturers sufficient time to make necessary changes.

For standards to be effective they need to be enforced. There are two stages of enforcement: (1) initial model certification, and (2) inspection at the point of retailing. Public institutions are supposed to enforce standards, but there is scope for the participation of consumers and the public at large. Institutional mechanisms have to be strong enough to support the enforcement of standards. Lack of agreement and weak enforcement mechanisms have been serious impediments to the effectiveness of past efforts to improve the efficiency of consumer appliances (World Bank 1993: 63).

While standards can be effective in ensuring minimum efficiency levels, they are unlikely to result in economically efficient ways of achieving those levels and they provide little incentive for further improvement once they have been complied with – standards tend to become ceilings as well as floors for energy efficiency. They may have the effect of discouraging producers from exceeding the levels set, or, in voluntary agreements, they can encourage manufacturers to further improve the efficiency of the appliances above this floor level. If the standards are well applied they can provide incentives for progressive improvement of ceilings if applied in association with progressive rebates or subsidies.

Standards have both positive and negative effects. Their negative effects are that they are difficult to design, and need to gain acceptance from the large number of people who will be affected. They are inflexible and difficult to change especially if they are mandatory, unless they include clear goals and are linked to procurement. As a result of their mandatory and inflexible nature, it is important that there is close collaboration with manufacturers in their development. In addition, substantial advance notice should be given to the various stakeholders so as to avoid compliance problems (Robinson 1991: 639-41). In addition, regular negotiations are also necessary to refine and improve standards.

Standards also change the design and production of appliances. This affects the financial status of the manufacturers and appliance consumers (changes in their energy bills, the appliance prices and operating costs). Some of these changes can be obtained at little incremental costs. The production cost will also depend on the measures being adopted and the cost of associated changes in production lines for manufacturers. Manufacturers might have to replace or retool their production lines which would require a major investment and therefore increase the cost of the appliance for the consumer. These costs are called transitional costs and if sufficient time is provided to manufacturers, they can be reduced.

There is also a need for financial mechanisms to be made available for retooling the industry. This has become evident in the phase-out of CFCs, for example. China has stated that it will only phase out CFCs by 2005 provided there is adequate financial and technology transfer (Nadel 1995: 5). Financing mechanisms that can be considered are the multilateral banks and the Global Environment Facility (GEF) (Dutt 1995: 67).

Appliance standards can be either voluntary or mandatory - these are discussed briefly below.

2.2.2.1 Mandatory standards

Mandatory efficiency standards represent the easiest and most reliable method of increasing energy efficiency (Robinson 1991: 639). Mandatory standards are written into legislation (Nadel 1994). Such standards include minimum efficiency standards (MES) and minimum energy performance standards (MEPS) (Harrington 1994: 1), both of which establish a minimum level of operating efficiency for all appliances. They have had the effect of removing appliances that

fail to meet the specified level of energy efficiency from the market (Meyers et al 1990: 9-5; Rollin & Beyea 1985: 433; Nadel 1994).

In the US, California state set standards in the late 1970s. Because of the size of the Californian market, these standards had an immense impact on the national market and also played an important role in the establishment of national standards. Mandatory standards have been set for refrigerators, freezers, room air-conditioners, water-heaters, heat pumps, dish-washers, clothes-washers and -dryers (Meyers et al 1990: 9-5). Analyses by Geller (1987), Geller & Miller (1988) and Geller & Nadel (1994) estimate that, as a result of the national efficiency standards written into legislation, nation-wide savings to consumers will be approximately $7 billion in 2000 and electricity savings in that year will be approximately 120 000 GWh and 48 000 peak MW. Additional savings will be realised as more stringent standards are developed (Nadel 1994: 1).

Taiwan has also adopted minimum efficiency standards for electrical appliances, although their impact is still somewhat uncertain. Standards for window air-conditioners, fans, water-heaters, clothes-dryers, ovens, stoves and refrigerators have been set. Since the standards for air-conditioners took effect, their average efficiency has improved by over 40%. The Taiwan energy committee estimated that 795 MW of generating capacity was saved between 1981 and 1988 through appliance efficiency improvements (Meyers et al 1990: 9-5).

2.2.2.2 *Voluntary standards*

Voluntary standards are normally set as goals for improvement rather than as a minimum level to be attained. Generally, government, together with the manufacturers in some cases, sets goals and manufacturers voluntarily respond. Voluntary standards have been set in Japan, Germany, Switzerland, Australia, Brazil, India and the Philippines. In Germany and Switzerland voluntary standards have been met successfully by manufacturers. In Germany in 1980 the government reached an agreement with manufacturers to improve the efficiency of specific products by up to 20% by 1985. The efficiency goals were voluntarily increased by the manufacturers twice because they did not want to be regulated (Meyers et al 1990: 9-5);[1] with a contributory factor being the cohesiveness of the German appliance industry and the low levels of imports into the country (Energy efficient strategies 1995). In Australia, however, manufacturers did not respond to voluntary standards because they were not binding and enforced. Japan had to induce appliance manufacturers to improve the efficiency of specific products through negotiations. The Japanese government established targets for energy efficiency improvement for various appliances in 1979; in the cases of refrigerators and air conditioners, however, the targets were essentially orders. Brazil is an example of a country where the government and the appliance industry negotiated a protocol to improve the efficiency of appliances. In India and the Philippines there has been no attempt to assess the response of the manufacturers (Meyers et al 1990: 9-5, 9-6). Meyers et al (1990) suggest that in many developing countries negotiation of voluntary targets for efficiency improvement between government and industry may be the more effective approach.

2.2.2.3 *Appliance standards for other energy sources*

Australia is the only country with standards for gas. The standards specify the requirements for gas energy labelling, and include gas approval and test specifications (safety and operation standards) (Harrington 1994: 3). Kenya has implemented a fuel-efficient stove dissemination programme. Karekezi (1993) does not mention whether standards are set for these stoves or not. According to him users are interested in the stoves for reasons of cleanliness, freedom from smoke, convenience, and safety.

2.2.3 Appliance labelling

Appliance labelling can provide consumers with information on the relative efficiency of comparable models of the same appliance. It aids in comparing the energy efficiencies and the estimated annual operating costs of competing brands and models of appliances (Anon 1993: 2). Appliance labelling involves displaying or affixing a label (tag or sticker) to an appliance. The

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[1] In Germany the voluntary standards will be phased out as the European Community introduces mandatory European labels for appliances.

label contains information on energy consumption or an energy efficiency rating of the appliance.

Appliance labelling can be either mandatory or voluntary at the point of sale. In many countries (EU countries, Australia, USA) labelling is mandatory through legislation and regulations which give force to the relevant standards and outline the requirements for labels. In Australia regulations also set out offences and penalties for parties not complying with the requirements (Harrington 1994: 6). In other cases labelling is mandatory only for appliances that are sold and not displayed. It should be mentioned that this limits the potential effectiveness of the programme, as experienced in France. Voluntary labelling allows the manufacturer or distributor the right not to display the label on the appliance. This has occurred in the UK, Germany, and European Union.

2.2.3.1 *Labelling programmes*

The two types of labelling programmes are known as *'endorsement'* and *'comparison'* labelling (Casey-McCabe & Harris 1995). Endorsement labelling helps consumers identify and distinguish similar products by providing the buyer with a single 'seal of approval' for those products which meet or exceed specified energy efficiency standards. A comparison labelling programme tries to provide consumers with information on all or most of the models within a given appliance category, leaving it to each buyer to compare and evaluate the energy performance of the appliance along with price, convenience, reliability and other features of interest. Examples of various labelling programmes are tabled in Appendix 1.

Approximately 11 countries and the European Union have energy labelling programmes. Most of these countries have comparison labelling programme whilst the US Canada and European Union have endorsement labelling programmes as well (Duffy 1996: 3).

Labels are normally displayed prominently on the front of each appliance. They contain various types of information. The content differs for different appliances. The most common type of information in the labels range from annual energy consumption, the energy efficiency rating (in the form of a bar scale for different models), energy usage in kWh of electricity, annual energy operating cost or a combination of all this information.

Australia's energy label

The label is quite colourful and uses a one to six star rating system. The star rating enables the consumer to do a quick comparative assessment of the energy performance of the appliance: more stars indicate a more efficient product. The label also shows the estimate of the annual energy consumption or the comparative energy consumption. The CEC differs for different appliances as it depends on the frequency of operation of the appliance (Harrington 1994: 4).

Canada's EnerGuide label

The law requires that most appliances be affixed with the EnerGuide label. The original label used to contain information on the monthly energy consumption of the appliance. The law was reviewed and it now requires all labels to include a bar scale of energy performance which enables consumers to compare the model with similar products and estimate energy consumption in kWh.

United State's EnergyGuide label

The label in the past showed the estimated annual energy costs for various competing models. The label now includes information showing energy usage in kWh of electricity.

The label on the appliance is normally supported by guidebooks or directories listing all the labelled appliances and other promotional material produced by government and other parties. Some countries (Denmark, Netherlands), instead of having labelling schemes, have detailed energy listings of appliances and their comparative energy consumption. These appliance lists contain information such as brand model, retail price and energy rating system.

2.2.3.2 *Effectiveness of labelling programmes*

The effectiveness of international labelling programmes in encouraging purchase of higher efficiency appliances is variable. Surveys in countries like Canada have found that customers initially ignored the energy labels during their purchasing of appliances. In the US a study of refrigerator labelling found that consumers had difficulty in using the labels to trade off energy

savings and product prices. The role of salespersons in this regard was looked at and it was found that in the US they gave a low profile to the labels – in Brazil, it appears, sellers of refrigerators tend to remove the labels in the store (Meyers et al 1990: 9-2). A survey in Australia in 1991 found that 28% of customers considered the energy efficiency rating to be the most important factor when purchasing a new appliance; 86% thought it extremely or fairly important; 14% considered it not important (Harrington 1994: 7).

In North America energy labelling has had some successes. It is estimated that Canada's Energuide appliance labelling programme undertaken in the early 1980s was directly responsible for an average 21% reduction in energy use of the appliances labelled and that energy savings of 466 GWh were realised. Interestingly, the Energuide programme had little impact on consumers' buying habits because over half of them did not recognise or use the Energuide labels (this lack of consumer response was cited as an important reason for ending the programme). The impact was on the *manufacturers* who removed inefficient appliances from the market despite the absence of consumer response. The experience of the Energuide programme suggests the importance of considering the factors that influence the production, as well as the purchase, of energy-efficient appliances (Robinson 1991: 637).

In Australia, which has a labelling programme regarded by many as the most informative in the world, the introduction of labelling in 1987 saw a significant increase in the rate of change. The government programme covers refrigerators, freezers, air-conditioners, dish-washers, clothes washers and dryers. A national gas-oriented energy labelling programme is also in place for water- and space-heaters. Potential appliances for gas and electric cooking, electric storage, solar and heat-pump water-heating systems are being considered for the future. Label recognition and use is high amongst prospective and recent purchasers of appliances. Australian labels for electrical and gas appliances differ. The gas labels are blue in colour whilst electric labels are black, yellow and red. The gas labelling programme has been largely voluntary to date and there has been good compliance due to the cohesive nature of the gas industry (Harrington 1994: 1-3; Wilkenfield & Associates 1993).

Whether consumers are able to understand labelling information is another issue. Labelling alone did not and still does not promote purchases and production of efficient appliances – other measures like technological developments and regulatory policy (mandatory standards) appear to have contributed to increased appliance efficiency. In the USA consumers were encouraged by being offered rebates to purchase efficient appliances. It is clear that for labelling to be more effective it needs to be complemented by other measures (McMahon 1991). In Australia the effect of energy labels is measured by looking at the level of awareness amongst appliance consumers. Market research there has shown that energy labelling awareness amongst consumers is consistently higher than 65%, with 90% for electricity labels, but only about 50% for gas – in the latter case, because of the voluntary nature of the labelling programme, the few appliances labelled and the nature of the gas appliances (Harrington 1994: 4). A few programmes have also reported that labelling has had a limited impact in the sense that some of the manufacturers were interested in participating while others saw this as unwanted government intervention in the market (Casey-McCabe & Harris 1995)

Given the potential importance of the information provided by labelling, it is essential that research be conducted to evaluate the effectiveness of such labelling. According to McMahon (1991), Marbek Resource Consultants conducted a survey of countries with labelling programmes, namely the USA, Australia, Canada, Denmark, Sweden, and Jamaica. Amongst these, the USA had not undertaken any research to evaluate the impact of labelling on consumer choice and on the appliance manufacturing industry. The studies showed that labels could provide useful information but might not induce significant behavioural change. Labels in some instances were not understood or used, which implied that educating salespeople could influence consumer selection of efficient appliances (McMahon 1991). A Federal Trade Commission (FTC) study was undertaken to assess the impact of labelling on consumers, and concluded that, when consumers were asked about various factors' importance in purchase decisions for appliances, responses ranked number of cycles, size, price, colour/appearance and brand name higher than energy efficiency (McMahon: 1991).

2.2.3.3 The negative effects of labelling programmes

Labelling programmes as currently operating also have some limitations, the main one being that obtaining the efficient appliance may be difficult for the consumer on whom lies the burden

of locating and identifying the most efficient model. The most efficient model cannot be quickly identified even by the brand and model number, and sometimes even the directories and listings of the models are not readily accessible (McMahon 1991).

Another limitation is that most consumers are unfamiliar with energy units (like kilowatts) and for them the most attractive factor is the price. The experience in the US is that consumers have responded positively to information on operating performance expressed in terms of dollars rather than energy consumption. It can be argued that this is a barrier that can be overcome by educating consumers (McMahon 1991).

Another limitation with energy labelling is that it has failed to eliminate the least efficient appliances or models. These in most cases are bought by consumers who are cannot afford the efficient ones due to affordability barriers (Harrington 1994: 7).

There are various options for increasing label effectiveness, including the following:

- Offer consumers cash payments or rebates for purchasing efficient models. This affects retailers and wholesalers because they tend to keep stock only of appliances that qualify for rebates, thereby effectively eliminating less efficient ones from their shops. These rebates have been implemented by many US utilities.
- Educate sales assistants and consumers on the advantages of efficient appliances.
- Offer sales assistants incentives based on the energy efficiency of the products they sell.
- Educate consumers on energy and economics so that they can make informed decisions (McMahon 1991).
- Energy awareness, information and promotion campaigns are critical for the success of the labelling programme (Nancy-McCabe & Harris 1995).

2.2.4 Testing and certification

Testing and certification programmes are vital to certify the accuracy of claims for an appliance's operating efficiency as given on labels. Thus the design of a testing programme is important for labelling and minimum efficiency standards (Phillips 1991; Turiel et al 1993: 3). Testing and certification can be either voluntary or mandatory – in France certification is voluntary. It can also be legislated that manufacturers develop voluntary testing methods. If these efforts are not successful, the department of energy should develop its own testing and certification procedures (Nadel 1994).

Uniform testing procedures are essential for appliance labelling, and they need to be updated so as to take into consideration any changes in usage patterns. Many less developed countries lack standardised testing procedures and there is a lot of uncertainty concerning test procedures (Meyers et al 1990). Uniform testing procedures should be developed to facilitate international trade. The USA, Australia, New Zealand, Canada, China, Mexico, Japan, Korea, Russian Federation and European Union have uniform testing procedures or protocols. Most of their testing procedures for refrigerators/freezers, are similar to those of the US, except in the cases of Japan and Korea (Turiel et al 1995: 2-1, 2-5).

A testing facility must be available to test and certify the operating efficiency of appliances. Testing laboratories have to comply with these testing procedures. In most countries testing facilities range from manufacturers' associations, standards bureaux/associations, standards councils and laboratories, and consumer associations (Waide 1993: 16). In countries with accredited testing facilities, these usually conform to national or international standards. The testing facilities are accredited by either national or international standards organisations (ISO and or IEC). EU member states have uniform testing procedures; if these are not followed, this can be easily identified by other countries.

Efforts to ensure accurate energy efficiency ratings need to be made to ensure compliance with standards. If the government leaves manufacturing associations to test their own appliances, in many instances the appliances do not conform to the standards as claimed in labels (Anon 1993: 3). In a case where Greenpeace International acquired test results from manufacturers (who did the testing themselves), their assessment was that energy consumption was on average 10.5% higher than the consumer association values had claimed for the same models. The manufacturers' response was that the discrepancy was caused by the different measurement

methods used in the UK testing facilities – an argument rejected by the testers from the consumer association in the UK (Waide 1993: 16). According to Waide it is imperative that independent testing be conducted at both the certification and point-of-sale stages. Heavy penalties should be imposed on manufacturers who do not comply with the standards and test procedures. The circulation and publication of performance test data for comparable models is often a powerful incentive for producers of low efficiency products to improve their products (Meyers et al 1990).

The question of the frequency of testing is not addressed by the literature.

2.2.5 Incentive programmes

The literature suggests that appliance standards and labelling are not effective policy instruments when implemented on their own, but that incentive programmes should complement the two strategies. Financial incentives can be used to encourage manufacturers, users, utilities and distributors of appliances to invest in energy-efficient appliances. Incentives include tax incentives, loans and grants, leasing, rebates, price subsidies, finance schemes, free installations, technology procurement and efficiency awards (Meyers et al 1990; Robinson 1991; International Institute of Energy Conservation 1991). The Super Efficient Refrigerator Programme (SERP) was a 'golden carrot' type programme which presented efficiency awards and implemented technology procurement programmes. It was sponsored by 24 utilities for production of high efficiency appliances. The award or rebate was used as a tool to spark competition amongst manufacturers to produce high efficiency appliances, with the manufacturers competing for $30 million. This approach has been used by Pacific Gas and Electric and Southern California Edison in the US and has proved to be successful (International Institute of Energy Conservation 1991: 96; Nadel 1994; Geller & Nadel 1994: 308).

Evaluations of incentive programmes present mixed results. Participation rates have tended to be low in some cases, although other programmes have been quite successful and have achieved energy savings. There is conflicting evidence on what factors increase participation. On the other hand, as discussed above, there is little evidence that financial incentives are crucial for the success of the programme. The most important influencing factors seem to be the way the programme is implemented and delivered, commitment and enthusiasm from the programme deliverers, as well as strong interaction between the deliverers and target audience. All of these factors highlight the importance of stakeholder involvement (Geller & Nadel 1994).

2.2.6 International trade and appliance standards and labelling

Appliance standards and labelling are increasingly becoming a requirement for trade. If countries want to export, especially to the European Union, they have to meet demanding export standards. Unlabelled products are facing difficulties in competing with 'ecolabelled' appliances bearing endorsements. Ecolabelling is increasingly becoming a trade-related instrument affecting both the manufacturers and consumers – if the appliance is not ecolabelled this might hinder trade. It is also essential that the country-specific ecolabelling scheme adhere to or be based on internationally recognised guidelines (Export Quality 1994). In this scenario, there is also the potential for international competitive pressure to lead to improvements in appliance technology and efficiency. If local manufacturers are shielded from this competition, their incentive to upgrade technologies will be much lower. The key to maintaining technological innovation is to keep local manufacturers informed and integrated into these international standards (Meyer et al 1990: 6.7, 9.2).

2.2.7 Barriers to improving and implementing efficient appliances programmes

Barriers to improving appliance efficiency are to a large extent the same as those that inhibit improvements in energy efficiency. In most countries consumers are not very interested in energy efficiency. First cost of the appliance and non-energy features (such as size, physical appearance) have a higher priority than the energy operating costs of the appliance. Manufacturers generally respond by keeping their costs low and not considering energy efficiency, as there is no incentive for them to do so (Meyers et al 1990: 8-1).

The barriers identified include:

- lack of consumer interest because of low electricity prices;
- lack of utility support and common vision;

- low value attached to energy savings;
- lack of information on energy efficient appliances, their current availability, their energy performance and savings from efficient appliances;
- affordability barriers as a result of higher first cost;
- absence of efficient technologies and products on the market;
- manufacturer resistance to the introduction of efficiency standards on the grounds that they would reduce consumer choice;
- profit maximisation by manufacturers overriding improving energy efficiency of appliances;
- separation of responsibilities for capital investment and payment of operating costs (Simmonds 1995);
- marketing and pricing strategies that promote features other than energy performance;
- the import of higher efficiency components and modification of manufacturing facilities which in most cases require huge capital availability;
- tariff barriers or high import duties that can inhibit the importation of efficient appliances or components thereof;
- insufficient local R&D conducted on efficiency in appliances;
- lack of communication and co-operation among government departments. For example, the department that deals with the appliance industry may place a lower priority on energy efficiency than the ministry of energy. Another example is when the finance department may refuse to lower import duties on energy efficient appliances; and
- lack of government commitment and policy framework to implement appliance efficiency programmes (Meyers et al 1990: 8-1, 8-4; McMahon 1991).

2.2.8 Strategies to overcome the barriers

Consumer organisations, NGOs or pressure groups, utilities, government, and the private sector all have important roles to play in overcoming the above-mentioned barriers.

Government	*Private sector*	*Utility*	*NGOs and pressure groups*
setting appliance standards and labelling	ensuring availability of energy efficient appliances	education and information campaigns	education and information campaigns
raising public awareness and informing the public	promotion campaigns	financial incentives (rebates, loans and grants to manufacturer, retailers and consumers), direct and free installation	pressurise government to implement energy efficiency strategies
lowering import duties on efficiency components or appliances that cannot be manufactured in the country	involvement in joint ventures with foreign companies to accelerate the manufacturing and technology transfer	price restructuring	
ensuring interdepartmental communication and an integrated approach, formation of government policy on energy efficiency	involvement of energy service companies	tariffs can be used to encompass payments for appliances	
development of financial schemes for end-users to ensure	investment in human resource capacity	invest in demonstration centres	

Government	*Private sector*	*Utility*	*NGOs and pressure groups*
that they buy efficient appliances			
take up technology procurement programmes		invest in the training of energy managers or technical staff	
invest in human resource capacity			
invest in research, development, dissemination and demonstration			

Table 2.1: Strategies for overcoming barriers
Source: International Institute for Energy Conservation (1994: viii 3-5)

2.3 South African experience

The local literature review considers South African appliance standards and labelling. There has not yet been a study conducted on appliance efficiency by local researchers. The majority of the literature consulted is from the South African Bureau of Standards' (SABS) information centre. The literature mentions fuels such as electricity, gas, paraffin, wood, coal and solar.

2.3.1 Appliance standards

In South Africa the SABS is the responsible authority in facilitating and issuing national standards, specifications, codes of practice and standard methods. The SABS can also amend and withdraw standards. The Bureau acts as the co-ordinator or facilitator for various stakeholders in developing and updating standards. SABS standards are developed by technical committees made up of the SABS, technical experts, the manufacturers and consumers. The committees are responsible for writing performance specifications falling within their scope of work and are encouraged to align and harmonise South African standards with international standards. Currently, the SABS appliance standards fall under technical committee *TC 71.5: Performance of household and similar electrical appliances and components thereof* (DMEA 1995).

The SABS uses the term standards to encompass specifications, codes of practice and standard methods as defined in the Standards Act of 1993.

South African standards address the following issues:

- operation or performance of appliances at specific voltages;
- a description of the product;
- safety rules and requirements of the appliance;
- particular performance and quality requirements that should be met by the appliance (such as operating with minimum smoke emissions, heat efficiency and heat loss tests for geysers);
- constructional requirements for appliances;
- packing and marking requirements;
- test methods (SABS catalogue 1994).

A detailed list describing the different appliances with their standards is available on request (or order) from the SABS.

2.3.1.1 *Compulsory specifications*

Safety and health specifications are compulsory. The SABS, however, is not responsible for enforcing these specifications.

3
Current trends in the South African appliance industry

3.1 Introduction

Stakeholders in the South African appliance industry include manufacturers, importers, distributors, wholesalers and retailers, unions and consumers. It is widely known as the household electrical durables industry, and is also referred to as the electrical appliance manufacturing industry. The manufacturing, wholesaling and retailing companies are owned by the monopolies or conglomerates that dominate the South African economy. They are active in manufacturing three types of appliances:

- *large appliances* known as 'white goods', which include stoves, dishwashers, refrigerators, washing machines and vacuum cleaners;
- *small appliances* which include irons, toasters, kettles, hot plates, hair dryers and food processors;
- *consumer electronics,* sometimes referred to as 'brown goods', which include radios, television sets, video recorders and hi-fi systems.

This chapter reviews the industry by examining its size, its structure and key players, the problems within the industry and possible future trends. Published reports were analysed and telephone conversations and discussions held with stakeholders. The review is based on reports from the National Electrification Forum (NELF), Industrial Strategy Project (ISP), the Trade Union Research Project (TURP), DMEA and consultations with other stakeholders.

3.2 The South African appliance industry

The household appliance industry is dominated by South African conglomerates. Small and medium enterprises do not play a significant role, although they are involved, to a small extent, in component manufacturing and supply, repair and re-manufacture, subcontracting, assembly and fabrication (Baumann 1995).

3.2.1 Appliance manufacturers

In the manufacturing subsector both South African and international firms supply appliances to retailers. Brand names play an important and influential role because consumers assess the likely quality of performance of the product by its brand name (Baumann 1995).

Until recently, appliance manufacturers were represented by three associations: the Domestic Appliance Manufacturer's Association of South Africa (DAMSA), the Small Appliance Manufacturer's Association (SAMA) and the Radio and Television Manufacturers Association of South Africa (RTVMSA). However, last year DAMSA was disbanded as various members felt it no longer served its purpose of supporting local needs. A number of DAMSA members were importing and this resulted in a conflict of interests between local manufacturers and importers of white goods (*Engineering News* July 1996: 27) According to Baumann (1995: i) these associations played the role of lobbying and public relations and rarely undertook any form of research, information gathering and publishing information about themselves. Table 3.2 gives some details of the companies in the industry.

Company name	*Ultimate parent*	*Products*	*Brands*	*Activities*
Amalgamated Appliance Company	Sanlam	Small appliances	HAZ, Salton, Tedelex, Pineware, Rowenta and Lion	Undisputed leader in small appliances, manufacturing and importing
Astra	KNJ-Sukhulu	Consumer electronics (TV)	Astra	Manufacturing and importing
Barlows Appliance Company	Barlow Rand Ltd	White goods	Fuchsware, Kelvinator, Leonard, National, Barlow, Gibson, Frigidaire and Electrolux	Major white goods manufacturer, manufacturing, importing and involved in distribution channel (hire-purchase finance)
Estia	(Pty) Ltd. (SA)	Small appliances	Estia	Manufacturing
Etron	BNDC & Others	Consumer electronics	Etron and Samsung	Manufacturing and importing
Fridgemaster	C Palmer and Management	White goods (fridges and freezers)	Fridgemaster, Galaxy and Super Frost	Manufacturing
Gentech	Powertech, Amic Daewoo and Nash	White goods & consumer electronics	Whirlpool, Indesit, KIC, Hitachi, Daewoo and Sansui	Manufacturing and importing (consumer electronics), involved in distribution channel
Hoover	Allied Electronics Corporation	Laundry products & small floor care appliances	Hoover	Largest laundry manufacturer, manufacturing and importing
Marine Appliances		White goods (fridges and freezers)	Megaflo and Econoflo	Manufacturing
MBS/Giant	E.Perch	Consumer electronics (TV)	Giant and Orion	Manufacturing and importing
National Panasonic	Barlow - Rand Ltd	Consumer electronics	National Panasonic, Futronie, Quintrix, Pilot, Technics and Goldstar	Manufacturing and importing
Nu world Industries		Small appliances	Ideal, WIK and Russel Hobbs	Major manufacturer of small appliances, manufacturing
Rowa	Rowa Enterprises and Roseaug	Consumer electronics (TV)	Rowa and Hitachi	Manufacturing and importing
SA Phillips	Phillips Netherlands	Small appliances, laundry products, consumer electronics & personal care	Phillips and Marantz	Major importing, manufacturing and involved in distribution channel
Tedelex	Sanlam	Consumer electronics and white goods (Microwave oven)	Sony, Blaupunkt, Westpoint, Litton, Empisal, HAZ and Tedelex	Manufacturing and importing
TEK corporation	Sanlam	White goods & consumer electronics	Ocean, Defy, Telefunken. Pioneer, Airco and Carron	Major white goods manufacturer, manufacturing, importing and involved in distribution channel (hire-purchase finance)
Triad	M Dersley	Consumer electronics (TV)	Triad	Manufacturing and importing

Company name	Ultimate parent	Products	Brands	Activities
Univa		White goods	Univa, Ariston	
Zero	Privately held	White goods (freezers and fridges)	Zero	Manufacturing

Table 3.1: The South African appliance companies and their parent companies
Source: Industrial Strategy Project and the Trade Union Research Project (1995: 11); Baumann (1995: 54-55, 58); Heyl (1994:17-18)

3.2.2 Appliance importers

The local appliance industry is also characterised by importers who compete directly with local manufacturers. Some of the local manufacturers are importers as well. Table 3.2 gives an indication of the major importers based in South Africa.

Company name	Ultimate parent	Products	Brands
AEG		White goods and small appliances	AEG
Bosch		White goods	Bosch
Braun	Gillettes	Small appliances	Braun
Consumer Products	(Pty) Ltd. (SA)		Helia
Darbel	(Pty) Ltd. (SA)	Small appliances (heaters)	Kapil
Gantech	(Pty) Ltd. (SA)	Small appliances (heaters)	De Longhi
Grandom	(Pty) Ltd. (Hong Kong)		Novex
Kenwood		Small appliances and consumer electronics (audio)	Kenwood
Mellaware			Mellaware
Miele	Miele	White goods	Miele
SA Housewares	(Pty) Ltd. (SA)	Small appliances, Consumer electronics (Audio)	Kenwood, Vax, Moulinex and Swift
Sharp	Seardel	White goods and Consumer electronics	Sharp
Speed Queen		White goods	Speedqueen
Supalek	Anbecco	Consumer electronics (audio)	Kenwood and Cortina
Teltron	Premier Group	Small appliances and Consumer electronics	Teltron, Sanyo, Akai, Salton and Berda

Table 3.2: Major appliance importers
(Source: Heyl 1994:17-18)

3.2.3 Appliance distributors

The retail sector is powerful, with wholesalers playing no role in distribution, resulting in a short and direct distribution chain. There are over 35 retail groupings which undertake the marketing and distribution of appliances. The retail groupings include furniture stores (JD Group, Ellerines, Morkels, Lewis, etc.), Pick 'n Pay, Dion, Game, Makro, Cashbuild, and so on. Most low-income consumers purchase from furniture retailers because they offer hire purchase and lay-by schemes. The furniture stores also tend to be located in close proximity to pedestrian routes and central business districts, mostly in metropolitan areas (Stassen et al 1994).

The majority of the retailers are furniture stores (members of the Furniture Traders Association (FTA) (Baumann 1995: 21; Heyl 1994: 32-3). They can choose whether to source their supplies locally or to import appliances. The average mark up (excluding finance charges) for all retailers

in South Africa is 37%, while the average mark up in the furniture outlets is higher, at about 44% (Stassen et al 1994; Heyl 1994: 36).

3.2.3.1 Other marketing and distribution systems

Eskom is involved in the marketing of electrical appliances, and has a strategic marketing plan called *Electrowise*. *Electrowise* offers a free advisory service to consumers on the safe and efficient use of electricity and appliances. This scheme also distributes a 'starter kit' consisting of a kettle, iron and two-plate hotplate at reduced prices. The idea is to facilitate the movement of appliances from the manufacturer to the consumer with Eskom staff acting as linking agents with wholesalers and retailers. Eskom has established *Electrowise* test and demo centres in townships; they act as advisory, education, demonstration, displaying and marketing centres (Fowles 1993: 4).

Two municipal electricity distributors, Cape Town and Durban, are involved in the marketing and provision of electrical appliances. They provide a two-plate stove with every new connection. Others display certain cost-effective affordable appliances to customers applying for new connections. Only one local authority has an 'assisted installation scheme' that enables electricity consumers to buy electrical appliances to a maximum of R3000 which can be paid off in instalments over 3 years at a particular interest rate (Fowles 1993: 4).

The involvement of municipalities in marketing appliances to households in future is uncertain and will depend upon the restructuring of the industry and the form it ultimately takes.

3.2.4 Other stakeholders in the industry

3.2.4.1 Unions

Unionised workers in the electrical appliance industry belong to one of three unions: the National Union of Metalworkers of South Africa (NUMSA), the Metal and Engineering Worker' Association (MEWA) and the Radio and Television Workers' Association (RTWA) (Baumann 1994: 60). The majority of NUMSA members are in the Gauteng area; most of the Cape workers are not unionised, though some of are represented by the conservative RTWA; in Kwazulu-Natal workers are MEWA members (Baumann 1995:60).

South African unions have not been as influential with regard to the development and running of the appliance industry as is the case in Australia and New Zealand. Even though most companies have structures like workers' forums, these are not regarded as channels for workers participation and involvement in the running of the industry, but are viewed rather as motivational 'talking shops' (Baumann 1995: 60).

NUMSA has realised that it has to play a more proactive role in terms of the running of the industry especially in the current economic climate with workers facing retrenchment. In addition, there is a possibility that the industry may adopt more technology-intensive methods of manufacturing in the near future. There is a division within the industry about which route to take: importing or the local manufacture of products - clearly, these issues will affect workers (Monake 1995).

3.2.4.2 Consumers

Higher income consumers tend to have high levels of appliance ownership in all three categories. Given the historically low levels of electrification in the country, and the relatively short time for which new customers have been connected, it is not surprising that a comparatively small proportion of black households own electrical appliances. Also, coal and paraffin appliances are more affordable and easier to purchase.

A study by LHA Consultants for NELF showed that there is a low level of knowledge about electricity and appliance availability, prices and quality amongst consumers, especially those from the disadvantaged sectors. Moreover, there are different purchasing patterns in different areas. Some consumers in Gauteng purchase new electrical appliances rather than second-hand ones (Stassen et al 1994: 6; van Rensburg 1994). On the other hand, according to a study in Khayelitsha by Thorne (1994), consumers tend to purchase second-hand appliances.

Another important factor relating to the lack of growth of the industry is the gender division of labour in the household and work environment. As long as women are used as cheap or unpaid labour in the household and workplace, and have little control over the use of household

resources, sales of certain labour saving-appliances will remain low. This is clear from studies which have compared energy service patterns with the gender of households' heads (Makan 1995).

The provision of education and information is vital and critical to increase penetration rates of efficient appliances. Consumers benefit from education, information and advice campaigns because they are able to make informed decisions. The advantages of energy centres have been argued by Williams (1994), and these centres could play a role of advising, educating and informing consumers.

3.3 The importance of the industry to the economy

The industry's share in the context of either the economy or the engineering sector is a relatively minor one and its contribution in simple output has not been great, although it makes a significant contribution through the employment of close to 12 000 people (this excludes the base material and base components sectors). In recent years, however, it has not invested in employment opportunities, rather cutting back and retrenching workers.

The market breakdown of various appliance subsectors in the industry is given in Table 3.3.

Item	*Retail value*	*Wholesale value*	*Local production*	*Local production share*
White goods	R1.60 bn	R1.21 bn	R0.85 bn	53%
Small appliances	R0.34 bn	R0.26 bn	R0.12 bn	34%
Total domestic appliances	R1.94 bn	R1.47 bn	R0.97 bn	50%
Audio	R0.85 bn	R0.45 bn	R0.17 bn	20%
Video	R0.95 bn	R0.61 bn	R0.45 bn	47%
Total consumer electronics	R1.80 bn	R1.06 bn	R0.62 bn	34%
Total	R3.74 bn	R2.53 bn	R1.59 bn	42%

Table 3.3: Household electrical market breakdown in 1992
(all values in 1992 Rands, excluding VAT)
Source: Baumann (1995)

From this table it is clear that white goods had the largest share of the market in 1991/1992. The market is evenly divided between domestic appliances (white goods and small appliances) and consumer electronics.

In 1990, the industry enjoyed varying levels of protection that ranged from 20% in the major appliances sector to 76% in the consumer electronics sector, and this protection helped its profitability. In line with changes initiated by the Government of National Unity, the Department of Trade and Industry (DTI) is reviewing the policies of the past government. The DTI is conducting industrial cluster studies to identify mechanisms or strategies to enhance the competitiveness of the industry and address economic growth and job creation goals.

As of 1995 an intensive programme of liberalisation has been launched, aimed at increasing competitiveness. In line with this, a phased reduction of tariffs over a period varying between 5 and 12 years was proposed. It has been recommended that the import tariffs be phased down in line with those of the World Trade Organisation (WTO), successor to the General Agreement on Tariffs and Trade (GATT)). WTO tariff obligations are from 0-30%. However, some of the proposed reductions exceed those imposed by the WTO.

The period since May 1996 has seen a steady fall in the value of the Rand, bringing with it advantages and disadvantages. For local manufacturers of traded goods for both export and domestic markets it represents a crucial 'window of opportunity' over the next 5 years, as there is a corresponding increase in the prices of imported goods - providing the basis for an export-led revival of the economy (Macroeconomic Strategy/Framework 1996). The disadvantages include the possibility of capital outflow and a balance of payments crisis; and higher import prices which could impact negatively on importing firms.

3.3.1 Production of household appliances

The production or manufacture of appliances in South Africa is largely influenced by brand names. Brand names are used as 'the source of product differentiation' (Baumann 1995: 43). Thus the development, protection and maintaining of brand names is a significant task that impacts on the quality of appliances produced.

In South Africa there are manufacturers who produce locally and those who assemble the appliances.

According to the 1985 census produced by the Central Statistics Services (1985), white goods and small appliances accounted for 68% of the total production, while consumer electronics accounted for only 32%. The 1989 census (Central Statistics Services 1989) indicated that that production share was still dominated by white goods as indicated in Figure 1.

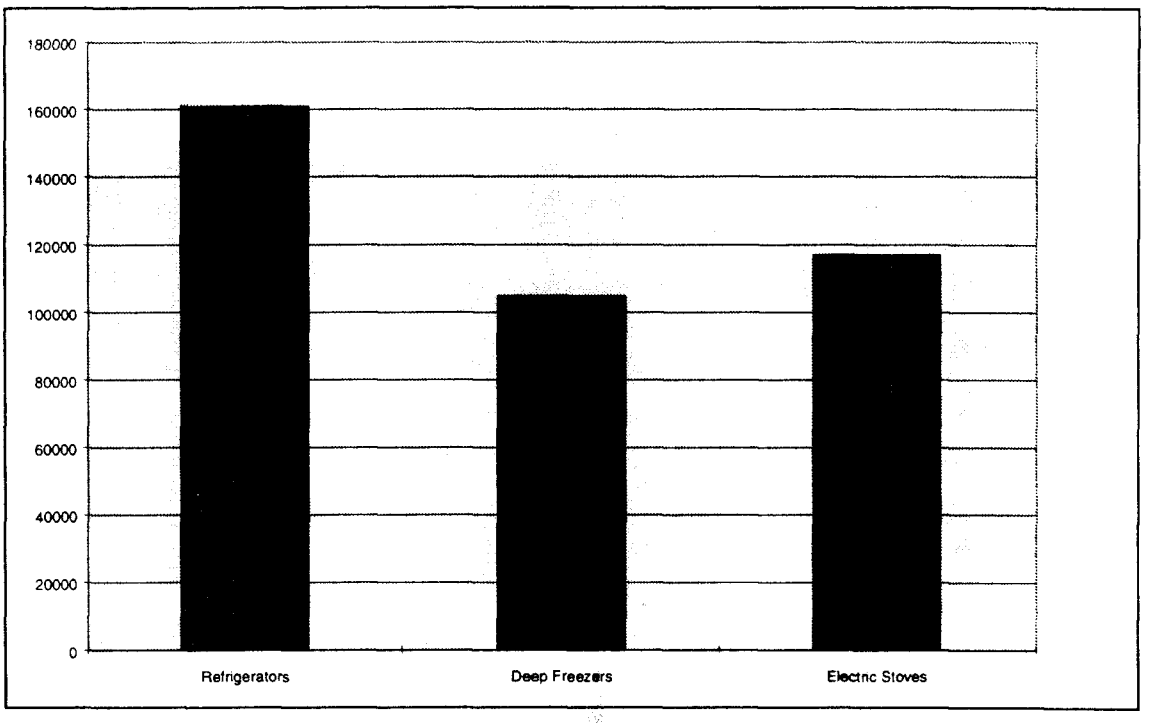

Figure 3.1: 1989 appliance census of the total number of appliances produced/assembled
Source: Central Statistics Services, Statistical releases (1995, 1996)

Over the years consumer electronics seem to have increased their production share. In 1991 consumer electronics were responsible for the highest production output compared to other appliances. Figure 3.2 below provides an indication of production shares of different appliances.

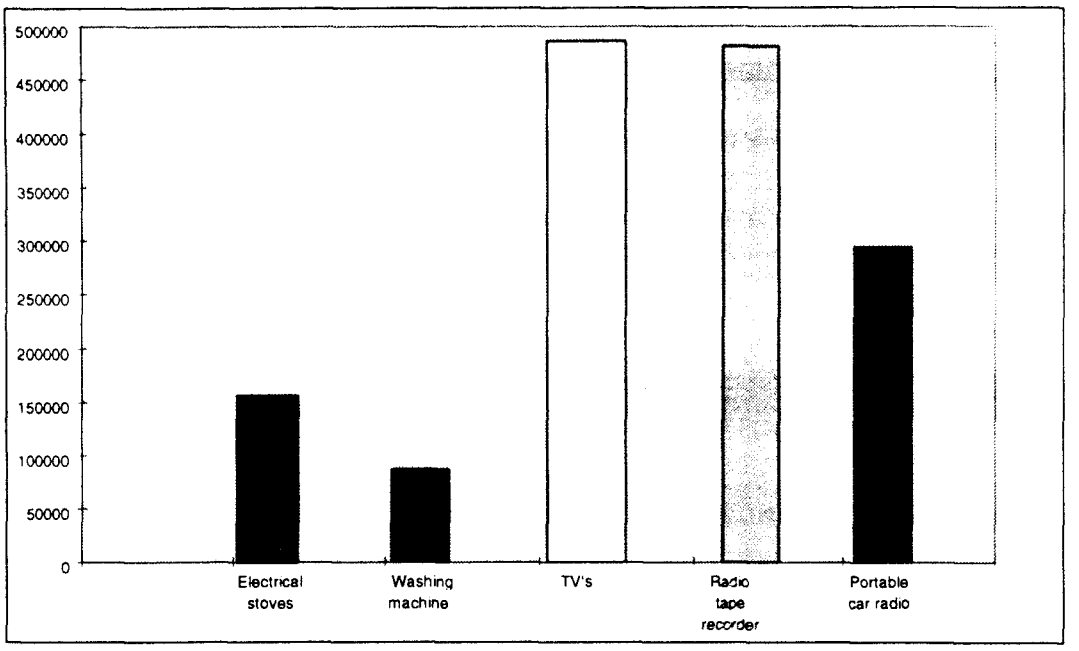

Figure 3.2: Total number of appliances produced (manufactured and assembled) in 1991
Source: ISP & TURP (1995: 15)

From 1992, virtually no black and white or colour TVs were produced locally. Nonetheless, they still account for the largest share of all appliances. Currently, refrigerators dominate the local production output, followed by electric stoves, deep freezers, hi-fi equipment and washing machines (see Figure 3.3).

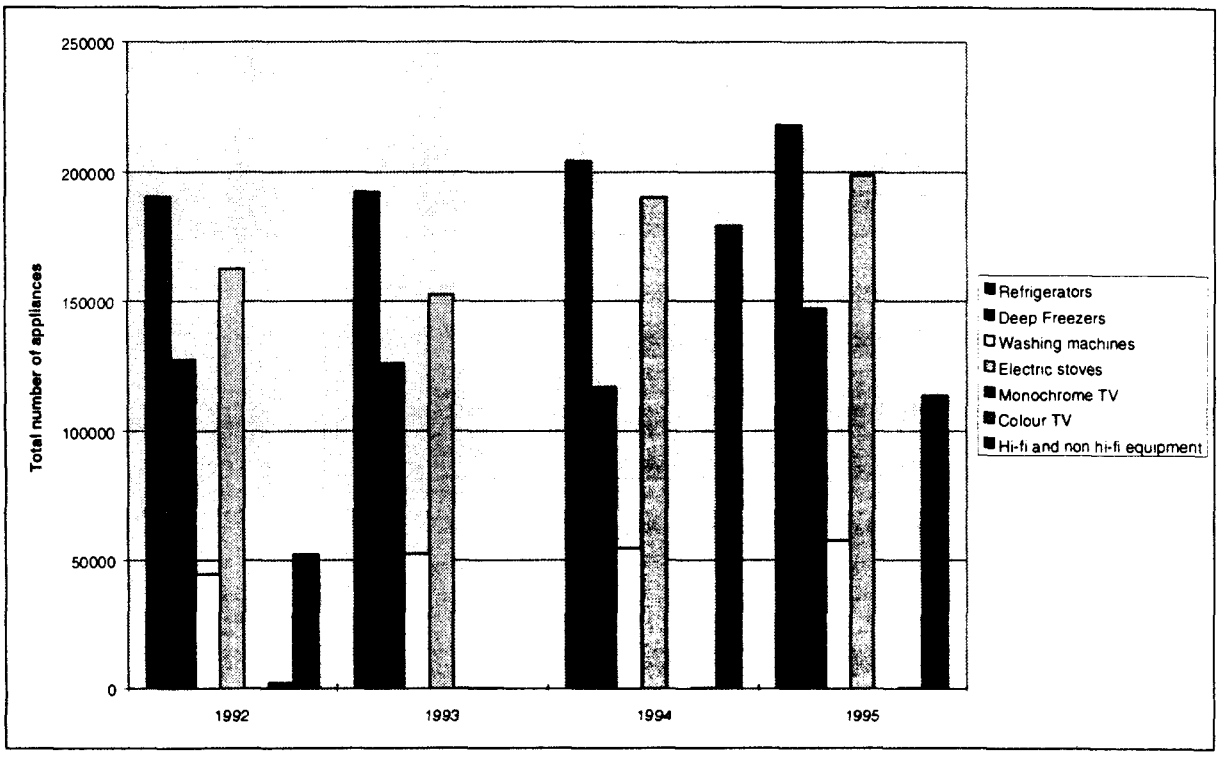

Figure 3.3 Total number of household appliances produced in 1992-1995
(Source: Central Statistics Service, Statistical release 1996)

3.3.2 Sales of appliances

Total retail sales of consumer electronics, domestic and small appliances represented 7.2% of total South African retail sales in 1993 and just 5% in 1994 and 1995. The total number of

domestic electrical appliance units sold during 1993 amounted to about 7.4 million (Stassen et al 1994: 3; Heyl 1994: 22; Retailers Liaison Committee 1996). Annual growth in sales value for total appliances (that is, all three types of appliances) at current prices for 1993, 1994 and 1995 was 14.7%, 15.2% and 16.5% respectively. These annual growth sales are for major national retailers and do not include independents and small retailers.

Between 1986 and 1992, appliance growth was strong for video recorders and M-Net decoders; consumer electronics in general recorded the highest growth in sales. The slowest growth was in domestic appliances, with white goods sales accounting for 17-20% of the market. The growth in the total sales of consumer electronics is a direct result of the accelerated electrification and housing drive (Heyl 1991), while the increase in TV channels also played a role. Sales have shown stronger growth in consumer electronics than in white goods for the following reasons:

- the demand for audio and video products is growing;
- competition between the retailers has kept the price of consumer electronic products down;
- purchasers of white goods are usually discouraged when economic conditions decline because these goods are 'income elastic' - as incomes decrease, the quantity demanded decreases at an even greater rate.

Table 3.4 presents estimated sales over a period of five years (1990-1994). From this it can be seen that high growth and high volume products have been in colour TV sets, fridges, stoves, hi-fis, irons and hotplates. This is all due, at least in part, to the massive electrification drive.

Description	*1990*	*1991*	*1992*	*1993*	*1994*
Consumer electronics					
Colour TV	304	373	437	466	496
Mono TV	275	157	240	300	265
Video recorders	105	141	149	147	146
M-Net decoders	150	200	175	175	170
Music centres	233	306	228	193	284
Hi-fi's	54	53	70	81	81
Total consumer electronics	**1 121**	**1 230**	**1 309**	**1 362**	**1 440**
White goods					
Refrigerator equipment	340	320	380	400	440
Cooking equipment	390	380	380	430	455
Laundry equipment	240	220	230	235	245
Geysers	210	190	195	220	240
Total white goods	**1 180**	**1 110**	**1 185**	**1 285**	**1 390**
Small appliances					
Irons	-	-	1 130	1 145	1 280
Kettles	-	-	747	760	780
Hotplates	-	-	320	362	360
Haircare products	-	-	680	680	680
Heaters	-	-	320	320	320
Vacuum cleaners	-	-	150	150	150
Toasters	-	-	289	299	320
Mini ovens	-	-	45	46	47
Grillers/warmers	-	-	190	170	160
Electric frypans	-	-	140	140	165
Fans	-	-	180	180	180
Food processors	-	-	50	50	50

Description	1990	1991	1992	1993	1994
Coffee makers	-	-	100	100	90
Pressure cookers	-	-	50	55	60
Food mixers			90	90	90
Slow cookers	-	-	30	30	30
Carving knives	-	-	80	80	80
Blenders	-	-	30	30	30
Deep fat fryers	-	-	15	16	17
Juicers	-	-	40	40	40
Total			**4 676**	**4 743**	**4 929**

Table 3.4: Estimated annual appliance sales (Rm)

In 1996, refrigerators are increasingly dominating market share. One of the manufacturers, Fridgemaster, has increased its market share from 36% to 39% with sales rising by 24% from R221 million to R291 million (The Star, Business Report, August 1996).

3.3.2.1 Sales by race

It is evident that black consumers are increasingly becoming new clients for the appliance industry. For example, between 1990 and 1991 sales to black consumers increased by over 18% compared to the white market's 2.3% (Baumann 1995: 21). Black households fare better with regard to TVs, hi-fis and video recorders, owning 65% of radios, 40% of televisions, 49% of hi-fi sets and 10% of VCRs (Baumann 1995)

Black consumers tend to buy a TV first, with studies showing that a TV set is one of the first purchases made by a new home owner or an owner of a newly electrified home. Consequently, blacks account for nearly 70% of TV purchases, but only 20% of video recorder sales (Financial Mail, Corporate Report 1995). According to a study conducted by Amic Daewoo (1992), a large proportion of first-time buyers for television sets were black consumers, accounting for 46% of their total sales - about 202 000 units.

Data from 1991 shows that sales to black consumers were considerably higher than to white consumers, especially for TVs and hi-fi's (ISP and TURP 1995: 31; Baumann 1995: 21-22).

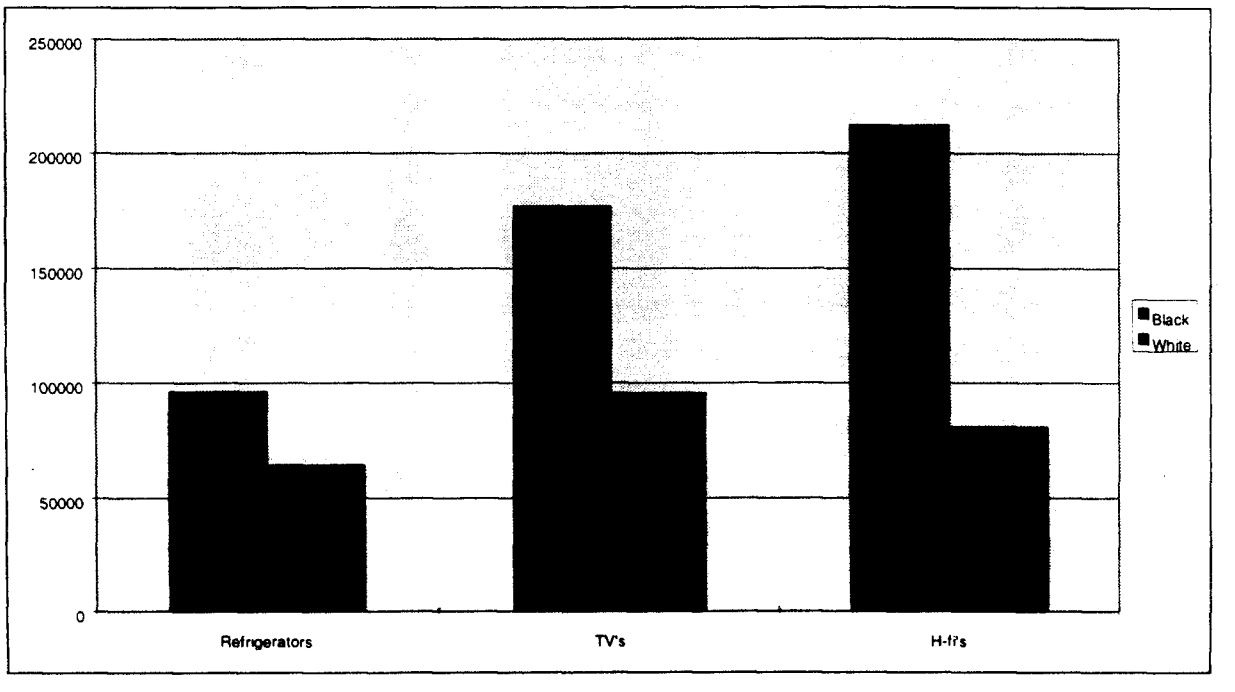

Figure 3.2 Appliance sales by race in 1991
(Source: Baumann 1995: 21-22)

The significance of this is that there is an emerging black market, made up mostly of first time buyers. This new market is defined by Gampel (1995) as being 'made up of young, upwardly mobile African urban residents. They have an increasing amount of disposable income and can gain access to alternative structures to attain extra funds to purchase appliances'. In addition to the commonly-used payment schemes of hire purchase and lay-byes, stokvels[1] are emerging as a new financing mechanism in the appliance market.

3.3.3 Imports and exports

In 1993, imports consisted of completely assembled units worth about R700 million and components worth about R500 million (in 1993 Rands). There is a high rate of import of finished products and components in the consumer electronics sector, resulting in a negative forex situation. Exports contribute only about R75 million, less than 5% of total industry sales (Stassen et al 1994: 3). The world market is dominated by large multi-nationals against which local firms cannot compete. For the South African industry to compete successfully in the world market, it needs to invest in advanced technology which will lower its costs and improve the quality of products. This is discussed in more detail in chapter 4.

3.3.4 Problems within the industry

The industry is currently facing a crisis and may not survive unless there is a clear long-term development policy and industrial strategy (ISP & TURP 1995: 1) and an investment friendly environment. The present crisis is characterised by poor performance, low levels of output, low employment growth, low levels of investment, over-production/supply, high production costs and poor performance in international markets. These can be grouped into the following key problems:

- *A weak internal market:* South Africa has a relatively small internal market by global standards. High real interest rates over the past decade have also discouraged consumer demand for household electrical appliances. However, the electrification drive could help to change this.
- *Poor performance in international markets:* The local appliance industry does not enjoy the economies of scale that exist in overseas companies. Local production costs are higher and the quality of products tends to be lower than those in many overseas markets. The local industry depends on labour-intensive manufacturing technology, and this will necessitate, if it persists, continuing protection to sustain it (Baumann 1995: 67). If South Africa is not able to adopt globally competitive manufacturing techniques the level of exports will further decline.
- *Lack of investment incentives:* There is little incentive for investors in the local appliance industry, for the following reasons:
  - devaluation of the Rand;
  - low profitability and poor returns;
  - an uncertain political climate causing most people to adopt a 'wait and see' approach (Baumann 1995: 66-67).

  This problem of a lack of investment incentives will probably be exacerbated by the WTO agreement's tariff phase-out or reduction.
- *Technological backwardness:* Many local manufacturing companies are characterised by a low level of innovation, lack of design capability, low skills and a dependency on international brand names (ISP & TURP 1995). The industry is a technology consumer and has not developed advanced technology manufacturing techniques. In addition, it has not kept pace with the rest of the world. The industry allocates minimal resources to R&D and lacks a skilled human resources base that would enable it to move into the manufacture of sophisticated products either for local consumption or export (Baumann 1995).

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[1] Stokvels are groups of people who club together to pool money to either lend it out to be paid back with interest after a certain period of time, or to purchase goods (including appliances) for club members.

- *Costly components and raw materials:* The goods produced locally are too expensive for the local mass market, as local components and raw materials cost more (and the quality is poorer) than is the case for foreign competitors.
- Import duty phase-out or reduction under the WTO agreement.
- The recent decrease in the value of the Rand and high interest rates are also factors that have affected the industry, with higher import prices impacting negatively on importing manufacturers and distributors.

Against this background, the challenges for the appliance industry can be summarised in the form of the following questions:

- Is the industry willing and able to re-organise itself so as to tap the domestic and export markets where there are huge opportunities?
- Are manufacturers and the retailers capable of maintaining their market share in the mist of the phased reduction of import tariffs?
- Would the appliance industry be able to penetrate new markets on a continuing basis?
- Would they be able to contribute to economic growth and create jobs?
- Would they be able to compete globally?

The crux of the matter is that the survival and viability of the South African appliance industry is largely dependent on its ability to compete globally, especially in the context of the phased reduction of import tariffs. The industry also has something of a window of opportunity provided by the electrification and housing programmes in which it can develop and grow. It is in this context that strategies to improve electrical appliance efficiencies have to be developed.

4
Import and export of appliances

4.1 Introduction

Trade in household appliances takes place both as finished products and in component form. In South Africa trade in electrical appliances is subject to the government's tariff protection policy, which has been in place since 1924. This policy provides a measure of protection for the local industry, against cheaper and better quality products manufactured by foreign companies, in the same way as other companies in the manufacturing sector have received this protection.

In general, South Africa's trade performance in the appliance sector has been poor, with very low exporting rates. This is due to the inability of South Africa's appliance manufacturers to compete on the international market in terms of quality and price of their manufactured goods.

This chapter reviews the current trade of household appliances to and from South Africa. This is necessary since standards and labelling programmes will be affected by, and may have an effect on trends in the export and import markets. An important consideration is the need to avoid dumping in local markets of low quality products from international sources. Furthermore, if legislation is passed on appliance standards and labelling, this could also ensure that all products entering the country are tested and certified according to standards and labelling requirements.

The chapter outlines South Africa's past tariff structure and the proposed phased reduction of the structure. Trade liberalisation agreements and their impact on the electrical appliances industry are discussed, and a description is given of trends in exports and imports. A brief discussion of customs and excise is presented and a conclusion follows.

4.2 South Africa's tariff structure

The 'trade regime' in South Africa - that is, the set of rules and regulations that govern trade in household electrical durables - comprises *ad valorem* duties[1], surcharges, excise duties, formula duties and special rates of duty (Baumann 1995: 87). These features of tariff protection can apply to finished products, components or both.

Trade of appliances in South Africa has been controlled and guided by government in various ways through tariff protection. Before 1995, duties on imported electrical goods ranged from 10% to 96% across all types of appliances. For small appliances, tariff duties ranged from 10% to 20%; for domestic appliances, from 15% to 30%; and for consumer electronics, to over 90%. The high tariff duties for consumer electronics were put in place largely for revenue raising purposes (Baumann 1995; Financial Mail, Panasonic Corporate Report, October 1995).

Duties on imported components or parts varied; ranging from 0% for TV tubes to 100% for other components/parts. On average, duties for small appliances and white goods parts were approximately 30% (Baumann 1995).

Another feature in tariff protection is the import surcharge. The import surcharge is a temporary increase in import taxes to raise revenue for the government and limit imports. However, in the trade of consumer electronics, the import surcharge has become a permanent increase. Surcharges for small appliances vary from 5% to 25% for some white goods whilst for consumer electronics they range from 40% to 45%. Surcharges for parts are normally lower. If surcharges were to be eliminated in the case of televisions, local production would stop (Baumann 1995).

In addition to protecting local appliance producers, tariff protection has also resulted in problems:

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1 An ad valorem duty is a percentage tax of the value of the good/product.

- the creation of dependency of manufacturers on tariff protection for their existence and survival;
- the proliferation of manufacturers who exist only because of very high rates of protection;
- the use of inefficient methods of production by appliance manufacturers;
- producers do not achieve sufficient sales to create economies of scale in production; and
- higher prices of goods for consumers (Baumann 1995).

Tariff protection has been part of South Africa's trade policy for many years. Since 1995, however, new developments have emerged. An intensive programme of trade liberalisation has been launched to increase South Africa's competitiveness in the global economy. As part of this programme, the following proposals were contained in an offer to the World Trade Organisation (WTO) (formerly GATT):

- replacing all quantitative import controls with *ad valorem* tariffs;
- simplifying and rationalising industrial *ad valorem* tariffs; and
- proposing a phased reduction of tariffs over a period varying between 5 and 12 years (Macroeconomic Strategy/Framework 1996; Joffe et al 1995: 48).

The GATT process requires the reduction of trade barriers and trade/export subsidies, with a tariff ceiling of 0 to 30%, depending on the sector.

The Department of Trade and Industry (DTI) has proposed and recommended the phased reduction of tariffs over a 5 year period, starting from 1995. The proposed reductions vary for the three types of appliances, ranging from 0% to 30%. For the TV manufacturing industry the Board on Tariffs and Trade recommended that *ad valorem* duty on TV sets be reduced immediately from 60% to 40%, in 1996 from 40% to 30%, in 1997 from 30% to 25% and that the provision whereby all components for the manufacture of TV sets are imported free of duty be maintained.

The strategy is to get the duties to be as low as possible in relation to the WTO ceiling and thus some of the proposed duties are lower than the WTO rates. It should be noted that these proposed changes still need to be approved by the Minister of Trade and Industry (Fourie 1995). The reduction of import tariffs at a rate faster than that required by WTO has resulted in tensions. The industry has realised and accepted the need for phased reductions while remaining aware of the need to maintain a stable local industry (Financial Mail, Panasonic Corporate Report, October 1995) The removal of these components of South Africa's trade structure will benefit local producers only if they can adapt and become competitive players in the global market.

The short-term impact of GATT will probably include the entry of new foreign manufacturers and distributors into the South African domestic market and the rationalisation of the industries, resulting in fewer larger industries. The agreement will force the local industry to be more competitive locally and internationally, whilst protecting the industry against dumping of low quality appliances. Similarly, GATT quality standards will oblige South Africa to comply with these standards (Stassen et al 1994: 8; DMEA Activity 1 Report 1996).

4.3 Trends in exports and imports

Statistics on exports and imports are not easily available, limiting an analysis of trends in exports and imports. Nonetheless, it is evident that the balance of trade for household appliances is uneven. In most cases it is strongly negative, with exports not exceeding 30% of imports (Baumann 1995: 89). The significance of this is that there is more capital outflow than inflow, affecting South Africa's balance of payments negatively.

Although South Africa is not a major player in world markets, it plays a significant role in the consumer electronics trade: according to Baumann (1995) out of the top 30 consumer electronics markets in 1990, South Africa was the 22nd largest producer and the 21st largest consumer and the 13th importer of consumer electronics.

4.3.1 Exports

South African manufacturers are unlikely to become major players in the export market in the near future, as South Africa' s export growth has been lower than that of its main competitors (Joffe et al 1995: 69).

Between the years 1980 and 1990, South Africa's exports have been mainly in white goods and consumer electronics (Figure 4.1). Within white goods, refrigerators have taken the lead followed by stoves and small appliances, and dishwashers (Figure 4.2). In consumer electronics, hi-fi, radio and VCR components dominated exports and they were followed by TV parts (Figure 4.3).

In some cases South Africa re-exports products that it does not manufacture locally. This happens with regard to refrigerators, dishwashers and TV components.

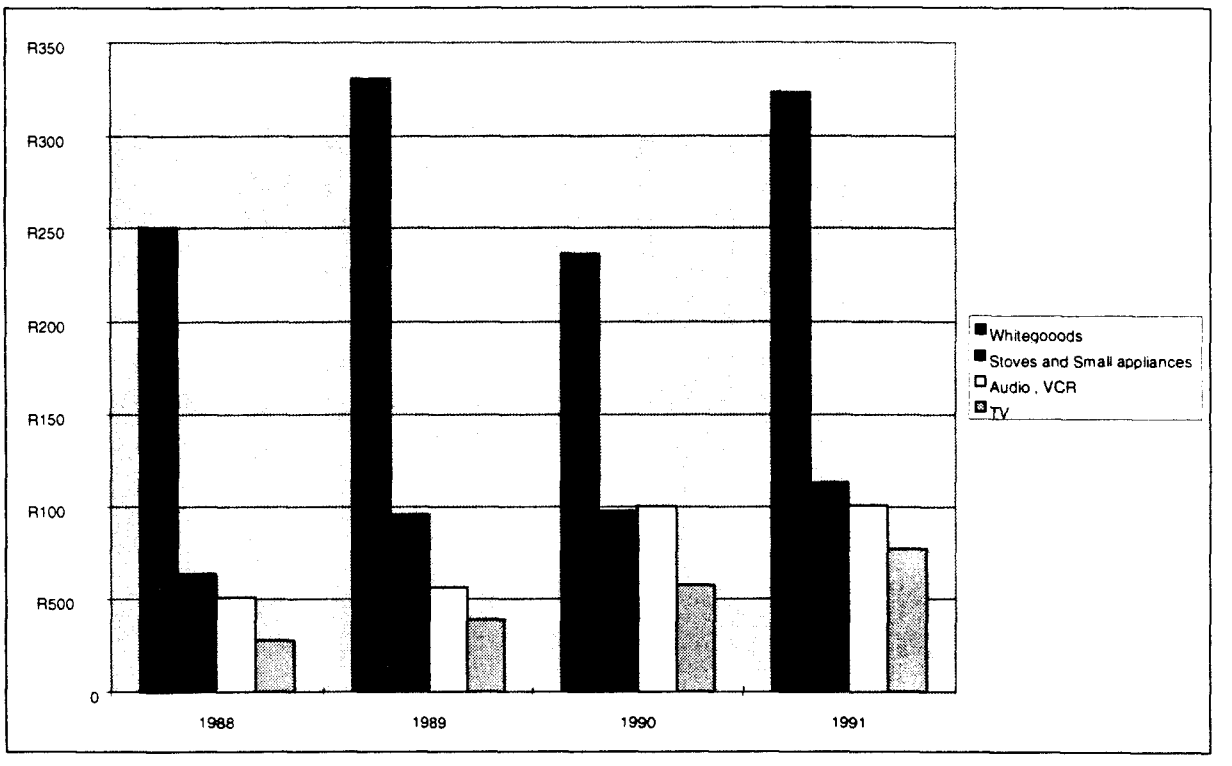

Figure 4.1: Exports of household appliances, 1988-1991 (Rm, 1990 prices)
Source: Baumann (1995); Household Electrical Durables Industries

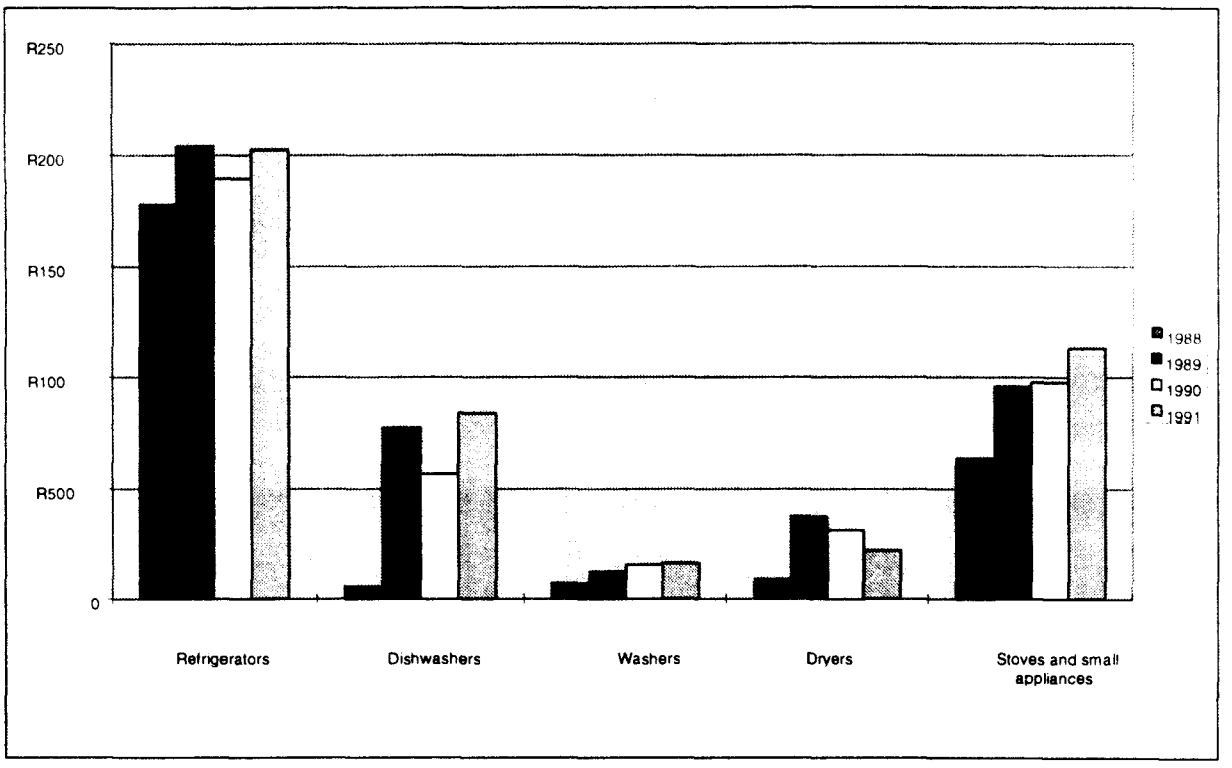

Figure 4.2 Exports of domestic appliances 1988-1991 (Rm, 1990 prices)
Source: Baumann (1995); Household Electrical Durables Industries

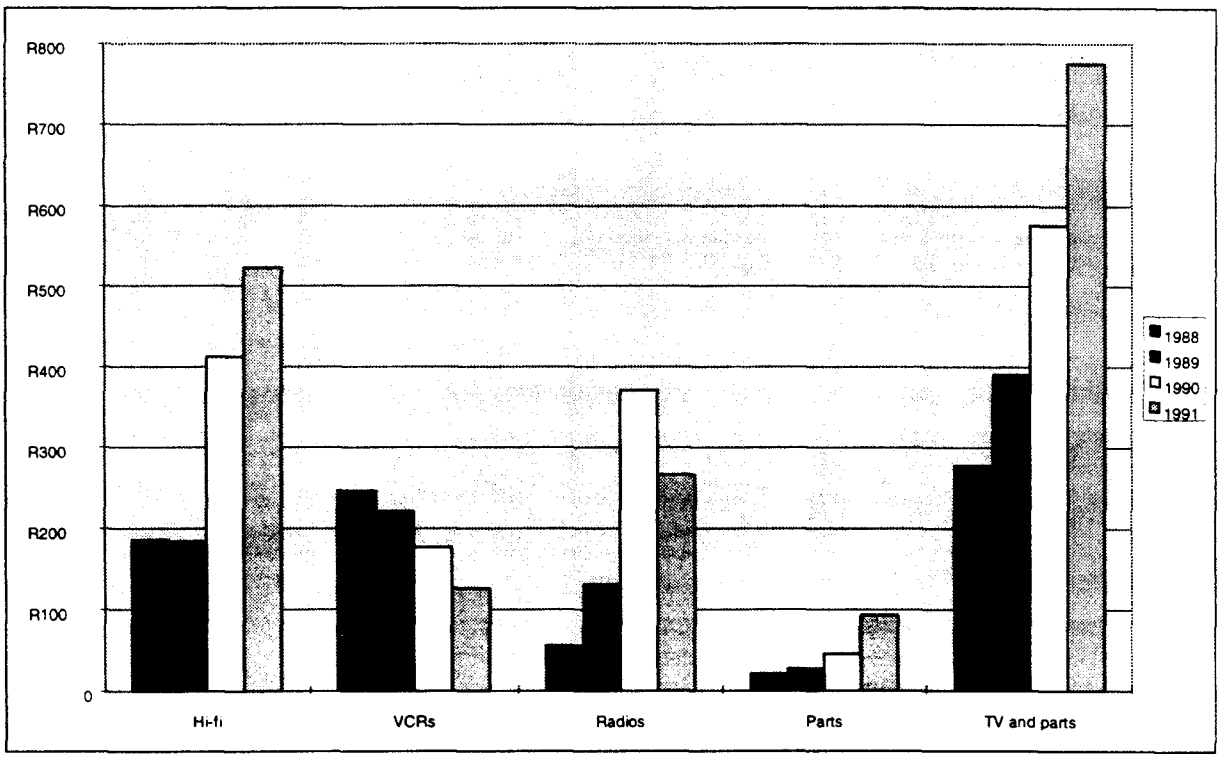

Figure 4.3 Exports of consumer electronics 1988-1991 (Rm, 1990 prices)
Source: Baumann (1995); Household Electrical Durables Industries

Information on the percentage of production which is exported could not be accessed for this report. However, an analysis of Figures 3.3 and 4.3 shows a correlation between the type of appliances produced and the type of appliances exported (albeit for different periods). Refrigerators and electric stoves dominated both the production and export markets. These appliances are followed by TVs and hi-fis. Even including the exports, TVs and hi-fi's were

taking a lead amongst consumer electronics. Lack of statistics has made it impossible to check current trends and identify which appliances dominate the market today.

Exports from South Africa have grown in recent years as local demand for appliances decreased, and manufacturers were obliged to seek outside markets in order to unload the surplus. Exports have grown significantly for all products. Increased growth in export value has been experienced in products that have a weak market (low demand) such as dishwashers, washing machines and dryers. An area in which growth was not expected was consumer electronics components, but exports grew by 56,6% between 1988 and 1991, at an average rate of 16.7% per annum (Baumann 1995: 103). These appliances are exported to African and European countries (Financial Mail, Panasonic Corporate Report. October 1995). The majority of re-exports in white goods and consumer electronics have been to Africa (Baumann 1995).

Between 1994 and 1995 trends in exports have not changedsubstantially. Whitegoods and consumer electronics still dominate the market. The changes that have taken place are that geysers are responsible for a large share of the export market, followed by refrigerators, stoves and small appliances, and then dishwashers. Dishwashers are catching up with stoves and small appliances. Within consumer electronics, TV and parts have gradually been gaining market share to the extent that they have replaced audio and VCRs. VCRs still have a very small market share and audios share has decreased substantially especially considering that between 1988 and 1991 they were responsible for a large percentage of exports under consumer electronics. (Commissioner for Customs and Excise 1996).

4.3.1.1 General Export Incentive Scheme (GEIS)

In order to encourage local firms to export, the General Export Incentive Scheme (GEIS) was introduced in the early 1990s for an initial period of 5 years which ended on 31 March 1995. The scheme was intended to:

- counteract the anti-export bias in the South African economy;
- encourage higher levels of beneficiation of products before export ; and
- encourage the export of products with a high South African content.

Measures undertaken as part of reducing the anti-export bias included the following:

- lower tariffs on inputs;
- rebates on exports;
- real effective/devaluing of the exchange rate;
- improved market access;
- access to tenders for African Development Bank/Japanese development projects;
- concessionary Industrial Development Corporation (IDC) investment finance;
- expansion of the marketing assistance scheme;
- pre-shipment export financing scheme; and
- small and medium enterprise programmes (Department of Trade and Industry, Media Release, March 1996).

For most manufacturers exports did not become viable until GEIS was introduced in the 1990s, which stimulated exports of various appliances. However, the M-Net decoder export market grew at a faster rate targeting European countries (Baumann 1995) and the export market for decoders seems like a potential growth market. In 1995 Panasonic clinched two major export deals worth R850 m to pay-TV subscribers in Africa and Europe (Financial Mail, Panasonic Corporate Report 1995).

After intensive discussions in the National Economic Forum (now NEDLAC) the GEIS was reviewed. It was decided to develop a revised GEIS which entails a phased reduction of the GEIS benefit levels, the elimination of certain structural imbalances (including the elimination of relative primary products from benefits) and the eventual termination of the scheme on 31 December 1997. This complies with South Africa's obligations since becoming a signatory to WTO. As the scheme is phased out, it is the DTI's intention to implement 'supply side' measures

which are in line with the WTO (Department of Trade and Industry, Guidelines for the GEIS Revision No 4, 1995).

As of 1995 only material-intensive products (category 3) and manufactured products (category 4) qualified for GEIS benefits. It has been proposed that the GEIS benefits be reduced in the manner shown in Table 4.1.

Date and duration	*Category 4 Existing plan*	*Proposed*	*Category 3 Existing plan*	*Proposed*
1/4/96- 31/6/96	12	12	2	2
1/7/96- 31/3/97	12	6	2	0
1/4/97- 31/12/97	10	6	0	0

Table 4.1: Proposed Adjustments of GEIS benefits (%)
Source: Department of Trade and Industry, Media release, March 1996

Exports are in most cases affected by exchange rates, global demand and local productivity. Since April 1996, the South African Rand has depreciated, and the exchange rate has been unstable. This depreciation of the Rand represented and still does represent a significant opportunity for producers to boost their export markets.

In response to the devaluation of the Rand, imports dropped but exports failed to close the gap in the trade account, as imports react more promptly to exchange rate adjustments than exports (The Star, Business Report, 29 July 1996). The lack of updated statistics on foreign trade has made it impossible to analyse how the appliance market responded to the recent depreciation in the value of the Rand.

It has been argued that South Africa is unlikely to become a major exporter of household energy appliances especially to developed countries. Baumann (1995) gives the following reasons why this is so:

- South Africa is geographically isolated from the major growth markets for household appliances. In addition, for South Africa to penetrate this market it would have to be competitive and produce high quality and high performance goods which will match international standards;
- South Africa will be faced with a growing domestic market as a result of the mass housing and electrification programmes;
- global markets are largely served by existing manufacturers. Most of these manufacturing firms use brand names and technology licenses for good quality products. South Africa would have to compete with these brands.
- the technological advancement of the global markets works negatively for South Africa as its technology is outdated; and
- the likelihood of Africa becoming a booming market for exports is slim.

On the other hand, South Africa's potential for exports is much greater in the African market than elsewhere (Cassim & Martin 1994). Although African markets are stagnating, it may be worthwhile for South African manufacturers to use their geographical advantage. The European and Asian markets are characterised by strong competition and dominant companies with huge market shares. South Africa with its small companies cannot survive in such markets unless local manufacturers enter into strategic alliances with these giant companies to access their strengths and markets.

South Africa's exports to Latin America, South Asia and South-East Asia are relatively small. However, it should give priority to developing trade agreements and linkages with these countries as their markets are growing rapidly (Cassim & Martin 1994: 10).

4.3.2 Imports

South Africa's manufacturing imports are dominated by appliances, followed by machinery, vehicles and components. In 1993, appliance and machinery imports amounted to R28 billion (1994 Rands) (Hirsch 1994: 6).

In the four years from 1998 to 1991, the composition of imports of household appliances shifted from 62% for domestic appliances to 48%, and from 38% for consumer electronics to 52% (Baumann 1995: 94). Consumer electronics are thus increasingly taking the biggest market share of imports. As Figure 4.4 shows, imports in consumer electronics dominated the market followed by white goods and small appliances in 1991.

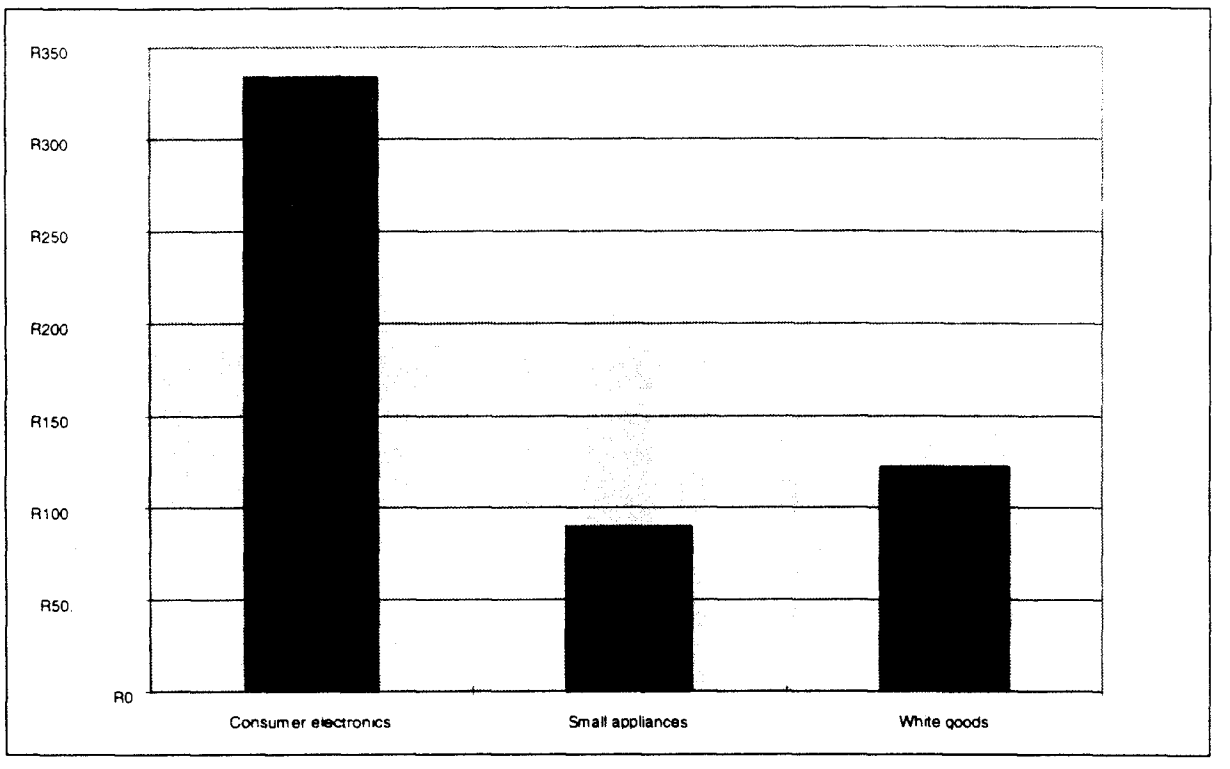

Figure 4.4. Combined imports of household appliances in 1991 (Rm)
Source: Baumann (1995)

Within consumer electronics, audio equipment is largest, followed by TV and white goods, as reflected in Figure 4.5.

Imports of small appliances and consumer electronics have risen since 1972. In the 1980s and 1990s consumer electronics and small appliances have increased their market share especially within black households. Compared to the 1980s, the 1990s saw increased rates of imports and this is in line with Eskom's electrification programme. Imports satisfied a significant part of domestic demand.

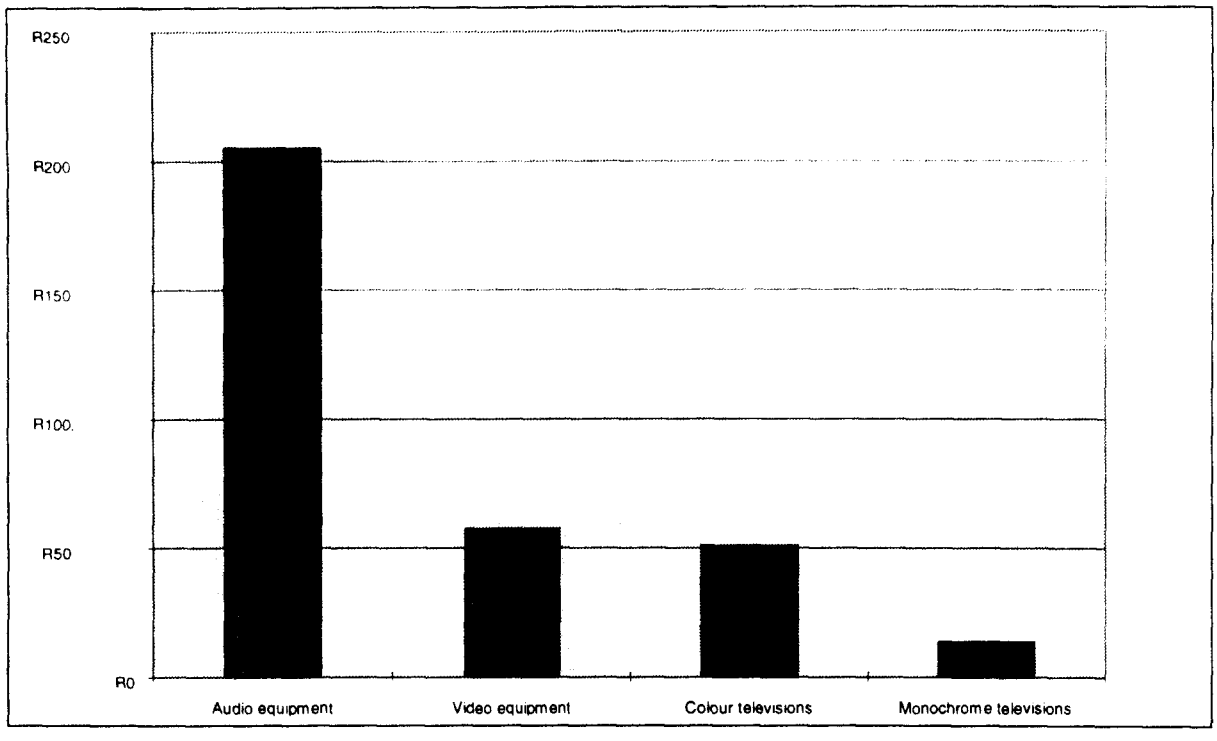

Figure 4.5: Imports of consumer electronics in 1991 (Rm)
Source: Baumann (1995)

Most of the consumer electronic goods imported into South Africa are finished products and in some cases components that are assembled in South Africa, including: television sets, video recorders (VCRs), video cameras and CD players.

White goods imported in 1991 are shown in Figure 4.6. These products are not produced locally in any large quantities.

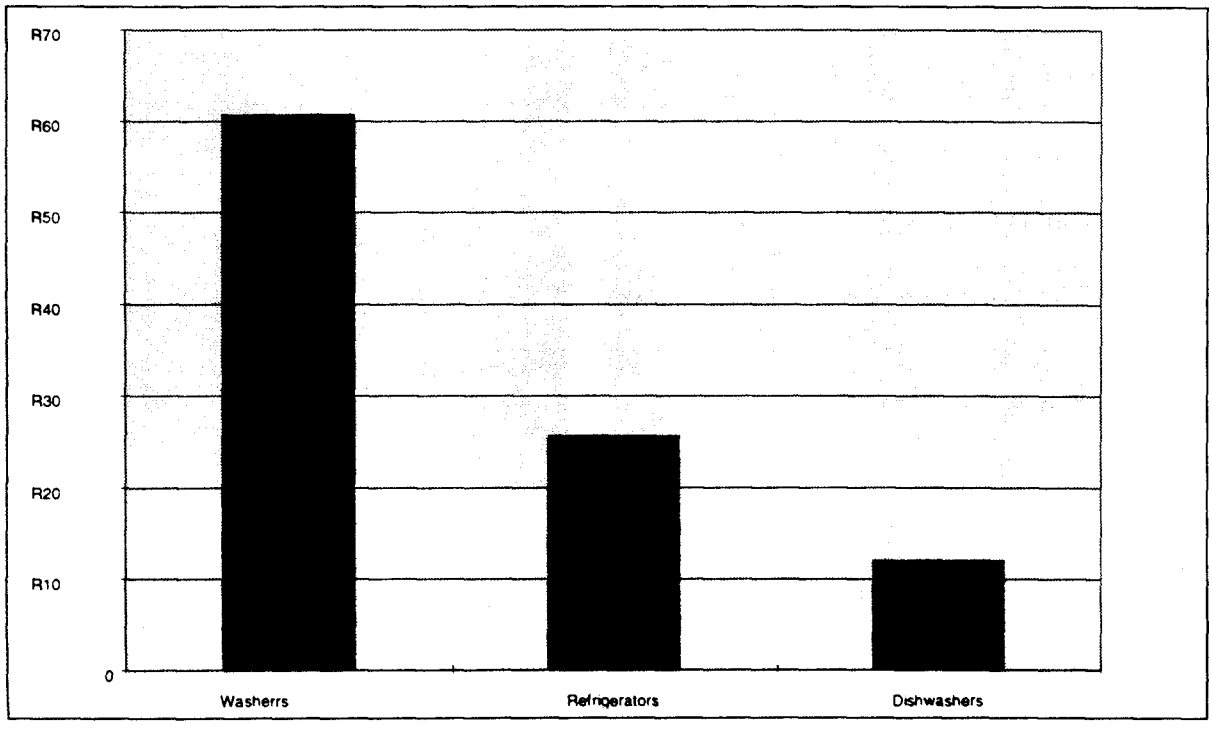

Figure 4.6: Imports of white goods in 1991 (Rm)
(Source: Baumann 1995)

Within the category of small appliance imports, microwaves are most significant, followed by electric radiators, hotplates, hair dryers and electric irons (Figure 4.7).

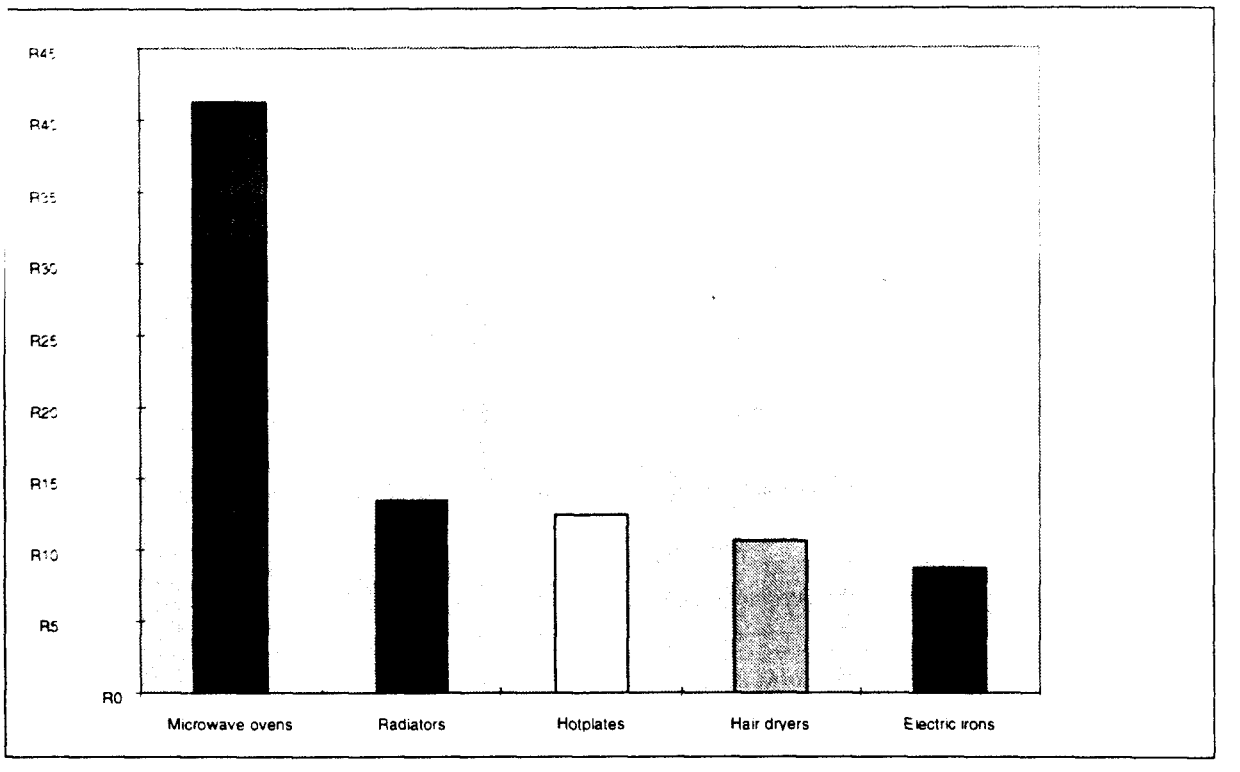

Figure 4.7: Imports of small appliances in 1991 (Rm)
Source: Baumann (1995)

Between 1988 and 1990 unit imports fell as a result of 'credit restrictions, import surcharges and weak demand' (Baumann 1995: 91). After credit limits and surcharges were lifted in 1990, imports increased. Another reason for the increase in imports in 1990 and 1991 was the phased-in relaxation of ordinary duties on certain TV imports, which led to an increase in monochrome imports in 1990.

Between 1994 and 1995 the composition of imports for households appliances has changed. Currently whitegoods are now leading, followed by consumer electronics and then stoves and small appliances. Within whitegoods, dishwashers are dominating the market, followed by geysers, refrigerators, stoves, and small appliances. Compared to 1991 when washing machines used to dominate the market, their market share has declined substantially from over R60 million to below 10 million in 1995. TV and parts are currently responsible for a larger share of imports of consumer electronics, followed by VCRs and then audio and parts. In 1991 Audio and VCRs dominated the market and their share has been gradually decreasing.

Imports of parts or components are also significant. This signifies that the South African local manufacturing industry is largely an assembly industry. The consumer electronics industry largely entails the assembly of semi-knocked down and completely knocked down units. The small appliance and domestic appliance industries do import components but not to a large extent.

The import of finished appliances and components of appliances becomes a problem especially as those appliances need to be maintained and repaired. This creates the need for a countrywide maintenance and back up service (Financial Mail, Panasonic Corporate report, October 1995).

industry. It has been argued by local manufacturers that due to a lack of incentives for investment in South Africa, most recent investments have focused on improving marketing and distribution of imports and developing low technology assembly plants, rather than building local manufacturing plants. If South Africa wants to compete globally, it needs to consider investment incentives and also create strategic alliances with international companies.

The consumer electronics and white goods industries are amongst the fastest growing industries in South Africa because of the massive electrification programme. With this potential for growth, a clear industrial policy needs to be put in place to ensure that South Africa invests its resources more effectively.

5
International financing opportunities

5.1 Introduction

[illegible] energy efficiency is still very new in South Africa, both among producers and [illegible] not least including low-income rural and urban households. In the case of the latter, [illegible] holds experience energy poverty and the most important factor for them is survival. [illegible] ency and the purchase of efficient appliances is perceived as a luxury they cannot [illegible] However, problems such as pollution and environmental degradation call for energy [illegible] and energy efficient technologies as important demand-side measures. These [illegible] will certainly reduce health risks, energy expenditures and sustain the environment [illegible] generations.

[illegible] situation is that, while certain measures are being taken, these are not sufficient to [illegible] these problems. On the appliance side, there are chlorofluorocarbon-free refrigerators [illegible] factured, but the quantities are not known. Most white goods, small appliances and [illegible] electronics (brown goods) are imported. According to a study by the LHA consultants [illegible] mer National Electrification Forum (NELF 1994), energy efficiency as a concept was [illegible] known in the industry and in the production of appliances in South Africa. In this [illegible] pertinent to consider whether international and local environmental protocols and [illegible] may affect the appliance industry, particularly through the utilisation of financing [illegible].

[illegible] energy efficiency is a powerful tool for protecting the environment. There are [illegible] impacts associated with the production, transportation, storage and use of energy [illegible] the processes of combustion of fossil fuels, gases such as carbon dioxide, nitrogen [illegible] hane, and CFCs are released. These gases contribute to the global warming problem. [illegible] to the energy sector, other sources of these emissions are cement production, land [illegible] and the waste produced by humans and animals (Cooper 1995: 6.5). While [illegible] CFCs play a small role in global warming processes, they have a considerable [illegible] the ozone layer.

[illegible] 980s, research has revealed not only a global depletion of the ozone layer but also the [illegible] of more concentrated 'holes' in the ozone layer (Aucamp 1994; Keeting 1989). CFCs [illegible] are widely believed to be contributing substantially to this depletion of the ozone [illegible] 10-50 km above the surface of the earth (Keeting 1989). CFCs are commonly used as [illegible] and foam-blowing agents for insulation.

[illegible] er explores financial mechanisms linked to international protocols and conventions [illegible] ays in which they might affect the domestic appliance industry.

5.2 [illegible]national protocols and conventions

[illegible] nal conventions, treaties and protocols are negotiated amongst countries to provide [illegible] basis for international environmental law. These are usually underpinned by goals of [illegible] onal and global environmental sustainability. In most cases developed countries are [illegible] anced in the implementation of these agreements than the so-called developing [illegible] Developed countries have much greater capacity and resources, and are pressurised [illegible] environmental interests such as Friends of the Earth and Greenpeace. Developing [illegible] on the other hand, are concerned more with the struggle for survival and the [illegible] on of poverty. The resolution of global environmental problems understandably is not [illegible] st priority. Developed countries are concerned with the environment in part because [illegible] afford to make choices and their more basic development needs have been met. [illegible] countries, by contrast, are often not in a position to afford choices which emphasise [illegible] ental conditions at the expense of providing access to basic services to the poor. This [illegible] also expressed vehemently at a conference in London in the late 1980s by India and [illegible] 'the developed countries had already benefited from the CFC use and were now [illegible] to prevent Third-World countries using them in their industrialisation programmes. [illegible] oped world had more expensive substitutes available and this would add to their

AECI, South Africa's only manufacturer of CFCs, was involved in marketing and promoting a whole range of substitute products and also providing technical help for switching over to the new products. The chemical division of the AECI plant which used to manufacture 18 000 tons of CFCs decreased the level of CFCs to under 1000 tons and was demolished at the end of 1995 (The Star, 29 August 1995). The dismantling of the plant does not rule out the continued use of existing stockpiles of CFCs - this is an issue for further investigation.

The Department of Trade and Industry was, in the past, responsible for issuing export and import permits for CFCs but these are no longer issued. According to Steyn (1996) no one is allowed to import CFCs into the country. Anyone importing CFCs will be found guilty of an illegal act. Even though this is an illegal act, neither the Department of Trade and Industry nor the Department of Environment Affairs and Tourism have penalties for either importing or exporting CFCs.

5.2.2 The United Nations Framework Convention on Climate Change (UNFCCC)

The ultimate objective of this convention is to achieve 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system' (United Nations Framework Convention on Climate Change, Article 2: 5).

The UNFCCC (hereafter referred to as the FCCC) was opened for signature at the 1992 Earth Summit in Rio but was only ratified in 1994 and thus came into force in March 1995. The convention does not impose strict obligations upon its parties (Rowlands 1995). The member countries' commitment also depends on whether the country is classified as developed (industrialised) or developing. The convention sets the non-binding goal for industrialised countries of ensuring that their national emissions of greenhouse gases (GHG) in the year 2000 do not exceed their 1990 levels (FCCC, Articles 4.2 (a) and (b)). The member countries of the convention have subsequently met in Berlin in 1995 for negotiating new climate change action programmes.

South Africa signed the agreement in June 1993, expressing its agreement in principle with the Convention. It is now possible for South Africa to ratify the convention in order to become a party to the Convention and have membership to the Conference of the Parties. However, ratification had not taken place as at mid-1996 because of a lack of consensus, particularly amongst some environmental NGOs, about South Africa's policy on climate change. These bodies felt that the Department of Environment Affairs and Tourism had not sufficiently engaged stakeholders to publicly debate the advantages and disadvantages of becoming a party to the convention.

While this process of consultation has been taking place, South Africa is not bound by the requirements of the convention. It is unlikely that South Africa will be required to stabilise and reduce its GHG emissions in the near future. In terms of the FCCC, South Africa is a developing country and thus Africa will not face the same targets as the developed countries (van Horen 1996).

If South Africa ratifies the FCCC, this will result in obligations and as well as benefits. For example the immediate obligation would be to conduct inventory studies of the country's sources and sinks of GHG and also publish a national programme on climate change (Rowlands 1996). The benefit entails the right to receive financial assistance from the Global Environmental Facility (GEF) (Rowlands 1996).The GEF can, in principle, finance the incremental costs of projects which have global and national benefits in terms of reduced GHG emissions.

Ratification would also gain South Africa access to the Joint Implementation (JI) pilot phase. JI is an investment mechanism that allows one country to help reduce GHG or enhance carbon sinks in another country (Rowlands 1996). Although still a controversial issues, JI offers some potential for mutual developmental benefits to developing and developed countries, whilst simultaneously achieving global environmental goals.

5.3 Appliance industry retooling and environment protocols

The refrigerator industry faces a major challenge in the need to eliminate the CFCs that are used as refrigerants and foam-blowing agents. While developed countries agreed to eliminate CFCs by 1996, developing countries will have an additional period of ten years. South Africa was

classified as a developed country in terms of the Montreal Protocol due to the intensity of its CFC use. In order to manufacture CFC-free refrigerators and energy efficient appliances, industry retooling may be required. The latter refers to the introduction and installation of new manufacturing equipment and techniques to enable the manufacture of cleaner and more efficient appliances.

The Montreal Protocol has had a significant effect in eliminating ozone depletors from appliances. That is, the enforcement of this Protocol has caused chemical companies to develop alternative products, and appliance companies to develop plans for utilising these alternatives (Goldstein 1995). In South Africa some replacements have been developed but other applications still pose considerable problems. The problems centre around the physical properties of the refrigerant, the compatibility with lubricants and seals and the cost of the replacement refrigerants (Aucamp 1994). The FCCC has had no direct effect on appliance efficiency yet. In the United States, however, a Climate Change Action Plan has been initiated, a policy document that calls for government support for voluntary efforts such as utility incentive programmes and other government based incentives and disincentives for meeting the Conventions' goals. The US's Climate Change Action Plan also calls for the Department of Energy to issue appliance standards promptly (Goldstein 1995).

5.4 Financial mechanisms and resources

The multilateral development banks with energy investments averaging more than $5 billion dollars per year are the world's important investors in energy efficiency initiatives (Phillips 1991). The multilateral development banks include the International Bank of Reconstruction and Development (World Bank), the Asian Development Bank (ADB), Inter American Development Bank (IDB), and the African Development Bank (AfDB). A new agency, the European Bank for Reconstruction and Development (EBRD) focuses on Eastern Europe (Phillips 1991). These banks have been involved in providing assistance to countries that seek to invest in energy efficiency. The finance available from the multilateral banks usually covers at least the incremental costs of the conversion. With this finance a manufacturing industry may be retooled in order to produce models that use CFC substitutes without making any changes which would increase energy use (Dutt 1995: 66).

The World Bank has an affiliate called the International Finance Corporation (IFC) which is responsible for assisting private sector enterprises (Phillips 1991: xi). The IFC provides loan finance to businesses manufacturing, distributing or installing energy-efficient equipment (Phillips 1991: xvii). For example, the IFC is funding a Polish plant in order to modernise it, redesign equipment and modernise its production line. The World Bank has approved loans for actual energy efficiency improvements in industry and has included energy efficiency among the procurement criteria for selecting new manufacturing processes financed by its industrial restructuring programme (Phillips 1991).

Phillips (1991) points out that these multilateral banks have invested large amounts of money in energy conservation in most developed countries. However, in developing countries, less than 1% of the banks' energy lending over the past decade has supported energy conservation projects. This is partly because most developing countries are unfamiliar with the benefits of energy efficiency, and partly because the banks' staff do not view energy conservation as having much relevance to a country's macroeconomic conditions (Phillips 1991: 2-3).

6
Strategies to improve the energy efficiency of refrigerators, water heaters and lighting systems

6.1 Introduction

The value and importance of saving energy in South Africa has not been fully realised. Households and end users are often unaware of the energy consumption of their appliances in their daily usage. Furthermore, the government does not have any policy on improving the energy efficiency of appliances, although this is changing with the development of a new Energy Policy. The Energy Policy Discussion Document (Green Paper) identified improved appliance efficiency as one set of policy goals. In line with the development of an overall policy on appliance efficiency, specific strategies are needed to improve appliance efficiencies.

This chapter presents a number of possible strategies that could improve the energy efficiency of three sets of appliances: refrigerators, hot water heaters and lighting systems. These are chosen as they offer huge opportunities for saving energy. All these appliances have the potential for high penetration levels in households. The strategies outlined below are based on lessons extracted from the literature and are intended to be indicative of the possible future path. Further research is required before any of these measures can be implemented.

The chapter begins by outlining the current situation with regard to the above appliances and explains why these are chosen for improvements. Thereafter, a range of possible strategies are presented.

6.2 Trends with refrigerators, water heating and lighting systems

More efficient refrigerators, hot water heaters and lights have the potential to considerably limit future growth of household energy demand. In the following sections, each category is considered briefly.

6.2.1 Refrigerators

Refrigerators cover all domestic food cooling appliances. They are one of the major appliances acquired in most electrified households across the whole world. Refrigerators and freezers consume about 12% of domestic electricity in South Africa (Uken & Beute 1991). Refrigerators in South Africa are powered by electricity, gas and paraffin. However, gas and paraffin refrigerators are no longer manufactured locally (Baumann 1995: 36). Of all urban black electrified households in 1990, about 76% owned electric refrigerators and only 2% non-electric fridges (Baumann 1995: 36).

In households, refrigeration is a desired energy service that gives perishable food a longer shelf life. It is also vital for many small businesses or spazas. In most poor urban households refrigeration is not accessed as easily as lighting or radio and TV, because of higher entry costs. It is, as a general rule, a service acquired later when the household decision-maker has more personal disposable income. This happens in most formal households. In the Western Cape, Thorne and Theron's (1993) survey conducted in Khayelitsha observed a trend of purchasing second hand appliances, including refrigerators.

In order to ensure that second-hand appliances adhere to standards, some international analysts have suggested that manufacturers stamp their appliances with a metal name plate so that it will continue to be available as the appliance moves through the used product market (Shephart et al 1990: 22).

Internationally, the most important efficiency improvements have been effected with refrigerators and freezers. Their efficiency has increased substantially during the past 20 years. For example, in the US and Europe 'the average efficiency of new refrigerators (measured in terms of refrigerated volume per unit of electricity consumption) increased by around 112 percent during 1972 to 1990 without any radical technology innovation or product redesign' (Levine et al 1992: 11). In Brazil the most efficient model consumed 30% less electricity than the same model manufactured in previous years. In South Korea it was estimated that the electricity

consumption of a typical 200 litre refrigerator declined from 670 kWh in 1980 to 240 kWh per annum by 1987 (Meyers et al 1990). This is a clear indication that significant energy efficiency improvements in refrigerators can be achieved.

Energy consumption can be reduced through a combination of the following measures:

- use of more efficient motors and compressors,
- increasing insulation thickness,
- reducing door leakages,
- refrigeration cycle improvements, and
- use of larger heat exchangers (Geller 1994; Uken & Beute 1991).

While these improvements are likely to increase the price of the refrigerator, significant energy savings will still be realised over its lifetime. Some of the efficiency improvements can be obtained at little incremental cost. The price is affected by features such as material used for shelves, paint finish and insulation. Increased insulation thickness adds to the cost of the refrigerator because significant retooling is necessary. A Canadian retailer stated that additional insulation added C$40 to the 1989 retail price (Shephart et al 1990: 39). However, better insulated refrigerators use about 6% less energy (Shephart 1990: 39).

Based on the US experience, when analysing the change in prices of refrigerators over a 20 year period (1972 to 1993) unit energy consumption fell by 60%. Relative to the consumer price index, refrigerator prices declined by 20% between 1972 and 1992 (Dutt 1995: 62). In some cases the price rose far more slowly (Shephart et al 1990: 41). When the price rose in the US, according to Geller, efficient refrigerator models were 5-10% more expensive than their counterparts of average efficiency (Shephart et al 1990: 41). Another significant observation was that since refrigerators are produced in large volumes, improved energy efficiency can be achieved 'at very low cost, if changes are made at the time of the product redesign' (Dutt 1995: 62). Efficiency improvements in the US during the 1970s and 1980s had an even faster payback and lower cost of saved energy (Geller & Nadel 1994: 307).

All South African manufacturers import compressors and so they most likely would consider a cabinet change and insulation to reduce the energy consumption. In the long term, efficient compressors will be used. This will also require that standards for efficient compressors are put in place to avoid the dumping of sub standard compressors locally (Uken & Beute 1991).

Existing standards on refrigerators in South Africa prescribe the levels of insulation and requirements for marking of refrigerators. The standards also stress the reduced use of CFCs, which are now prohibited. Nonetheless, there is still room for improvement by considering more efficient motors, compressors, insulation and so on.

The reduction of CFCs may inhibit the reduction of energy consumption (Feist et al; Uken & Beute 1991). The refrigerant used in refrigerator compressors to date is CFC-12 which has an ozone depleting effect of 1 (maximum). The insulation material used in refrigerators uses CFC as a foam blowing agent (Uken & Beute 1991). South Africa is busy converting to non-CFC insulation and refrigerant compounds to comply with the Montreal Protocol. This obligation of manufacturing CFC-free refrigerators can be taken as a window of opportunity to ensure that as CFC-free refrigerators are manufactured, the refrigerators should be energy efficient as well. Technology required to replace CFC products without compromising energy efficiency is available. For example, R&D on CFC substitutes continues in order to get the best substitute without shortcomings (Feist et al; Uken & Beute 1991).

6.2.2 Water heating

Water heating is a basic energy need or service in a poor household. Hot water is normally used for bathing, cooking and washing clothes and dishes. Water heating is the primary energy consuming activity and accounts for some 30 to 50% of the total household load. Indications are that water heating offers huge load shifting potential as a DSM measure.

Water heating can be provided through electricity, gas, solar, paraffin, wood and coal appliances. In most electrified high-to mid-income housing, electric geysers are installed as part of housing delivery, whereas in low-income households there are very few geysers. In most cases geysers are installed by those building the house or owners of rented housing or flats. As a

generalisation, builders are seldom informed about the energy efficiency of geysers, and are most concerned with minimising the up-front capital cost of the geyser as opposed to its life-cycle costs.

Across the world the average efficiency of geysers increased by about 5 - 10% during the past 20 years by improving insulation and heat traps (measures that prevent heat losses when hot water is not used) (Levine et al 1992).

Significant energy savings may be realised by implementing the following measures:

- use of insulation blanket,
- use of high efficiency, low pressure geysers or heat pumps,
- instant water heaters,
- solar electric water heaters (Levine et al 1992; NELF Database 1993).

Upgrading the efficiency of hot water heaters from 82% to 90% through better insulation and use of heat traps is estimated to cost $36 at the retail level and saves about 300 kWh per annum in a US residence (Levine et al 1992: 13). The simple payback period at average US electricity prices is 1.5 years. In 1991 the most efficient water heater produced in the US had efficiency ratings of as high as 98% (Levine et al 1992: 13).

Heat pump water heaters have been used in the US since the early 1980s. They are highly efficient, consuming about 50-70% less electricity than electric water heaters. Another advantage of the heat pump is that it can be used to provide space heating and cooling in addition to water heating. In the US heat pumps have proven to be as effective as solar water heaters but at a significantly lower cost. The first cost is around $800-$1200, four times that of a conventional electric water heater. The payback period for the initial costs is about six years (Levine et al 1993: 13). Problems experienced to date have to do with sizing and climate variables.

Instant water heaters have been used in some European and developing countries. These are efficient since there are no storage and distribution losses (Levine et al 1992: 13). Instant water heaters can use either electricity or gas. The only major problem occurs when there is no supply of either electricity or piped gas.

The cost of improving water heating systems increases with insulation foam and the costs have been projected to increase with the phase out of CFCs (Wilkenfield & Associates 1993: 195-8). The costs will also be affected by whether the manufacturers have suitable inputs, and if not, they may need industry retooling or importing which would require a major investment. The costs vary according to the different design options. For example, heat pump water heaters are more costly than electric water heaters.

Manufacturers of geysers in South Africa agree that it is reasonably easy to decrease standing losses by increasing the insulation of the geysers and the first two metres of water pipes connected to the geyser (Uken & Beute 1991). Despite this, South African geysers tend to be wasteful because insulation materials are not very efficient.

Another important factor is that water heating also contributes to the peak load in the morning and evening. In order to reduce this contribution, geyser ripple controls have been introduced to manage the load during peak hours but only in a limited number of areas (Beute 1993).

The obvious way of reducing energy consumption would be to consider standards. Most hot water geysers sold are required to have an SABS mark, and therefore issuing new specifications for reduced energy consumption would not be a problem (Uken & Beute 1991).

With the drive in South Africa to meet the housing backlog, it can be assumed that a portion of these houses will be installed with a geyser and thus one can forecast a high rate of penetration. There is a need to investigate the rate of geyser acquisition as the housing and electrification programmes are being implemented.

6.2.3 Lighting

Lighting is an essential service in the household and can be provided through electricity, gas, paraffin and candles. Some of the sources are potentially dangerous. For example, gas, paraffin and candles frequently result in accidental fires, and young children sometimes mistakenly drink paraffin. Lighting is normally the first energy service accessed by households as it is

needed for cooking, studying, small business operation and other needs. Lighting can contribute significantly to an increase in the quality-of-life in the household.

The most widely used lights in electrified households are incandescent light bulbs. These are the most inefficient electric lights. Cowan et al (1992) showed that fluorescent light bulbs had higher efficacies than incandescent bulbs, paraffin, gas and candles; however, they have a limited market share in South Africa.

Depending on the lighting technology, energy use can be reduced by 10-60% (Nadel 1994: 7). In India and Brazil it was estimated that efficient lighting technologies would save 35% and 22% respectively. For example, a 60 watt incandescent lamp can be replaced by a 52 watt energy saving lamp at no additional cost. The energy saving lamp reduces energy use by 13% and light output by 9%. Greater savings can be obtained with compact fluorescent (CFLs), fluorescent and more efficient incandescent lamps. CFLs have a high initial cost but last up to ten times longer than incandescent lamps. The high initial cost and the size of the CFL makes the CFL penetration limited and slow (Nadel 1994: 7-8). The energy saving lamps range in price from $7-$8 when purchased in very large quantities (technology procurement programme) and from $12-$25 when purchased individually in retail stores (Geller & Nadel 1994: 311). Fluorescent lamps have had a limited penetration in households because of their size, the quality of light and so on.

Lighting use can be reduced through the following measures:

- use of lighting controls and improved luminaries (Levine et al 1992: 19),
- use of CFLs and efficient incandescent bulbs.

Eskom is currently looking into implementing a pilot project on energy efficient lighting. The project will target existing electrified households and newly developed areas. It is hoped that efficient lighting will reduce the peak electrical loads and also reduce energy used by lighting. The objectives of Eskom's efficient lighting programme are:

- to increase awareness of CFLs,
- to increase sales by increased volume,
- to reduce the cost of CFLs to customers,
- to lower the impact of initial purchase,
- to make CFLs as freely available as a packet of candles (Henderson 1996).

6.3 Strategies to achieve efficiency improvements

A number of initial strategies for purposes of improving the energy efficiency of appliances are outlined below. The strategies are meant to act as pointers for the way forward for appliance efficiency in South Africa.

6.3.1 Commitment and support from government

Government support and commitment is essential for appliance efficiency initiatives to be successful. Government can provide leadership in facilitating and co-ordinating appliance efficiency programmes, introducing energy efficiency legislation, running efficient appliance competitions, introducing minimum efficiency standards, initiating appliance labelling programmes and being involved in technology procurement programmes.

6.3.2 Research & development, demonstration and dissemination

Initial R & D work needs to be done in order to develop advanced technologies. The government should also assist the industry in R & D on key technologies that are needed for significant energy efficiency improvements. The government could fund universities, SABS and national laboratories. Joint private and government research is another option to enhance technology research and development.

The key to successful appliance efficiency improvements is sufficient R & D, which can be conducted either before or in parallel with the setting of standards. This could also be done in collaboration with internationally accredited standards organisations. In the US state-funded

research and development projects contributed to achieving high efficiency (Uken & Beute 1991).

6.3.3 Support from utilities

Utilities can provide rebates and can also co-ordinate their incentives with the minimum efficient standards by setting threshold levels for rebate payments. In order to ensure increased market transformation the utilities can continue to provide incentives promoting the most efficient technologies (Geller & Nadel 1994: 308). They could run 'golden carrot' type programmes to stimulate demand. It is essential that utilities be involved in marketing and promotion of efficient appliances.

6.3.4 Minimum efficiency standards (MES)

MES prescribe levels of energy efficiency for appliances and international experience suggests that they need to meet the following criteria in order to be effective:

- standards should be developed as part of an integrated appliance efficiency programme;
- standards should be dynamic and subject to regular review and negotiation to reflect changing conditions;
- standardised testing procedures are essential for assessing the energy efficiency of new appliances. The testing procedures should be agreed upon by various stakeholders;
- sufficient lead time is needed for implementation from the time the standard has been announced until it comes into force to facilitate the necessary appliance development. If there are only small efficiency changes, this period can be between one and two years. If the efficiency changes are radical the time can be up to 5 years;
- efficiency standards need to be established in close co-operation with the manufacturers of the appliances and other interested and affected parties. Proposals for future energy efficiency standards must take into account the movement away from CFCs and other environmentally hazardous chemicals for use in insulating foam and refrigerants. The standards should ensure that domestic refrigerators do not employ ozone-destroying chemicals such as CFCs and can adequately operate on alternative refrigerants;
- standards need to be enforced at the point of manufacture, import and point of sale. It has been found in the US that enforcement at the point of sale is much easier (Nadel 1994: 5);
- mandatory standards need to be administered for the purpose of ensuring compliance with the proposed standards. For a mandatory standards scheme, an inspection procedure is required. The following administrative procedures should be adhered to:
  - registration of the manufacturer after the appliance has been tested;
  - market inspection to check if the appliances that are sold in the market are identical to the announced appliances and also comply with the requirements; and
  - sanctions in case of non-compliance with the requirements (Buhl-Pedersen et al 1993: 12).

MES have the effect of removing from the market appliances failing to meet the specified level of energy efficiency. Ideally, MES should be co-ordinated with incentives. For example, rebates can be offered for appliances that reach or exceed certain efficiency levels as set by MES.

6.3.5 Energy labelling

Labelling is an important measure for informing decision-makers about the appliance. Based on the stakeholder consultations undertaken in April 1996 by Marbek Resource Consultants and the Energy and Development Research Centre (EDRC), mandatory labelling would be preferred because it would help in 'levelling the playing field' for appliance manufacturers and retailers. Mandatory labelling would have to be enacted by legislation to ensure that the manufacturer and retailer provide, display and market the label. Labelling specifically for water heating would not be effective because hot water geysers are not purchased by the ultimate end-user but by developers. Appliance labelling on its own is not sufficient and needs to be promoted intensively by an awareness campaign.

6.3.6 Financial incentives and assistance

Consumer rebates can be offered to encourage consumers to purchase efficient appliances. Financial incentives could also be given to manufacturers to develop and produce efficient appliances. Incentives which are large enough to cover the capital cost of a new product line can be provided by the government or the utility. 'Golden carrot' type programmes that include the use of competition and tender bidding amongst manufacturers need to be considered. The manufacturer who produces an efficient appliance that meets the specified energy consumption level and delivery date could win a sum of money related to sales. Financial incentives should be available to cover the additional cost of providing appliances that are significantly more efficient than existing models. Low interest loans or international grants could be made available for upgrading the local manufacturing infrastructure to produce more efficient appliances. It must be stressed that utility promotion and financial mechanisms are needed in order to increase the penetration of these efficient appliances.

Credit facilities that will target low income households should be established and could be funded by the government, financiers, loans and grants.

6.3.7 Technology procurement and bulk buying

A bulk purchasing programme is also a 'golden carrot' type programme. Government, utilities or buying groups (made up of retailers) and developers can be involved in bulk purchasing. Any other groups that have buying power can also be involved in this kind of initiatives. These programmes have the potential to result in the following benefits:

- increased quantities of appliances produced;
- a guaranteed market for these appliances; and
- a contribution to price decline.

6.3.8 Promotion and media campaign

A media campaign to promote the use of efficient appliances and provide comparative lists of the energy efficiency of different models of domestic appliances could be conducted (Lebot & Waide 1995: 62). These lists should also be made available at the point of sale in retail and other distribution channels. Consumer organisations and CBOs are essential for the purpose of educating and informing people at the grassroots. The role of salespersons is also vital for the success of a labelling programme. Salespersons need to be educated and given incentives for encouraging consumers to buy more efficient appliances. Promotional campaigns for appliances can include free or direct installation, especially in the case of lighting. Direct and free installations have proven to be effective and suitable for low-income households (Levine et al 1991).

6.3.9 Human resource development

Human capacity in energy efficiency should be developed in South Africa. The training of engineers, artisans, unskilled and semi-skilled workers and technical people for the following functions should be undertaken:

- to conduct testing;
- to manufacture efficient appliances;
- to service efficient appliances; and
- to educate and inform end users about how efficient appliances are used.

6.3.10 Stakeholder oversight

A working group should be constituted by the government, with representation of various stakeholders to oversee and give direction on the implementation of some of these strategies to achieve appliance efficiency in South Africa. If an energy efficiency agency is set up, the working group could become part of, or be linked to the agency. In the interim, the working group can develop an action plan on how and when targets set should be met.

All these strategies need to be implemented in a complementary manner and should not be looked at in isolation to each other.

7
Conclusion

This report has examined and described South Africa's electrical appliance industry with regard to energy efficient appliances. It has helped to gauge the information and knowledge base and to identify information gaps.

The literature review provided some background on the issues surrounding appliance efficiency in general. From the review it is clear that there are lessons to be learnt but their applicability should be based on South Africa's unique circumstances. The most appropriate approach to dealing with appliance efficiency is to develop integrated policies and programmes, with a range of components. Prescriptive performance standards can be used where appropriate and these can be supplemented by incentive programmes involving free installation or an appropriate combinations of grants and loans. Education is also important and suitable programmes can be marketed by community groups and other credible and trusted stakeholders. In order to increase penetration rates and energy savings a more active role in delivery is required by considering, for example, direct installation as well as the financing of efficient appliances. Standards, labelling and incentives are not effective on their own but should supplement each other.

The South African appliance industry as a whole as well as subsectors of the industry, were reviewed in Chapter Three. The negative short-term implications of the phasing out of import surcharges by the Department of Trade and Industry were described. On the positive side, the RDP housing and electrification programmes are helping to open up the local appliance market. Black consumers are increasingly becoming new clients for the appliance industry. There is a need to investigate whether South Africa has sufficient capacity to be able to meet the demand that will arise as a result of mass housing and electrification programmes.

Chapter Four identified two linked major challenges which face the industry: the need to diversify its exports and its market. There is a need for more research on how to extend beyond African markets. Import figures are high and trends in imports correlate with the rising demand stimulated by these programmes.

Nonetheless, there is a debate on whether the local industry is economically viable or whether continued protection through the various features of tariff protection mentioned above is necessary. If there is no investment and tariff protection is removed the country will be obliged to meet its needs from imports and the local industry will collapse. These are some of the key policy issues which the industry has to address and in the context of which appliance efficiency policies have to be developed.

Chapter Five explored the financial mechanisms linked to environmental protocols and conventions and their possible impacts on the appliance industry. Pressure on South Africa to reduce ozone depleting substances and greenhouse gas emissions will surely increase. South Africa is expected to ratify the United Nations Framework Convention on Climate Change in the near future. These protocols will impact on the industry especially if it wants to adopt an outward approach by exporting its manufactured products. South Africa has already started to reduce the use of CFCs and there is a campaign to promote hydrocarbon substitutes to CFCs. The ratification of the protocol and convention has obligations as well as benefits. The FCCC, for example, offers potential funding through its GEF. There are other international lending organisations which play a role of investing in energy efficiency activities.

In Chapter Six various strategies improving the energy efficiency of refrigeration, water heating and lighting technologies were described. It is clear from this chapter that efforts to promote efficient appliances need serious consideration especially in the light of benefits that can result from them. There is little doubt that appliance efficiency programmes provide a wide range of benefits for the consumer, the environment, manufacturers, the utility and the country. Consumers save money; the reduction in energy consumption results in reduced environmental emissions; for utilities the benefit is the reduced need for investment in expensive power plants; and manufacturers can potentially benefit by gaining access to export markets, provided they achieve competitive status in the near future. South Africa and other developing countries could focus more on this major policy challenge: the need to ensure that domestic manufacturers,

wholesalers and retailers, who account for the vast majority of appliance sales, adopt the best available international standards and technologies for their products. This will also contribute to economic growth as South Africa benefits from increasing exports.

Programmes that combine standards, labelling, financial incentives and technical assistance yield the greatest savings and participation levels. The key issue for continued improvement in appliance energy efficiency is improved co-operation amongst the various stakeholders including government, the appliance industry, utilities, the private sector and end-users.

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Appendix 1
International labelling programmes

Labelling programme	*Focus/objectives of the programme*	*Characteristics of the programme*
Energy Star- US programme	Maximise voluntary participation by manufacturers Outcome: succeeded in its high rate of voluntary participation by manufacturers	implemented by government voluntary compliance product testing and certification done by individual manufacturer targeted at offices, domestic sector and commerce
Power smart -Canadian utilities programme (Power smart Incorporated) Label called the Product endorsement programme	The programme tries to 'push consumers and pull manufacturers' in a direction towards energy efficiency The programme geared towards increasing the efficient use of energy through a co-operative approach including the utilities, manufacturers and retailers Outcome: anecdotal evidence shows 95% of awareness of power smart	• established as a DSM effort a seal of approval type label voluntary compliance • it helps consumers identify energy efficient products • manufacturers have to apply for label and pay $500 fee
E-2000- Swiss programme	To establish quantitative goals for the average efficiency of products sold for several years	• target value programme for energy consumption • voluntary compliance • targeted at offices • award labels to products in the top 30% for energy efficiency.
BPA's blue ribbon/ 'Blue Clue' award campaign- US federal power marketing agency	To promote the purchase of energy efficient refrigerators To increase the market share of energy efficiency appliances and to determine how much education and promotion can impact the market Outcome: 22% of customers had been influenced and one quarter of the retailers found it a very useful sales tool	• established as a DSM effort • the programme awarded refrigerators and freezers in the top 15% for energy efficiency with blue ribbons • a brochure was used for listing these refrigerators • provided free award stickers to encourage retailers • targeted at consumers, retailers
Green seal label-US NGO programme	Offer unbiased expert advise to consumers on products that are less harmful to the environment	• the programme identifies and endorses energy-saving and • the programme environmentally friendly products that meet their standards • targeted at households, manufacturers takes a 'cradle to grave (entire life cycle) look at the appliance • manufacturers apply for product testing by paying a certain fee

Labelling programme	*Focus/objectives of the programme*	*Characteristics of the programme*
Environmental choice- Canadian government programme	The programme aids consumers to identify products that are less harmful to the environment The objective is to promote more environmentally conscious purchasing and support efforts to improve and/or maintain environmental sustainability Outcome: the label has not been effective and there seems to be a low level of public demand for labelled products (few people have seen it but do not know what it means)	• it oversees the development of environmental guidelines ad reviews research of environmental impact on products • it also examines opportunities for significant reductions • voluntary compliance • manufacturers apply for product testing and pay verification and license fee
European community ecolabelling- European Community programme	To encourage manufacturers to produce environment friendly products To better inform consumers on the environmental impacts of products	• the programme also assesses the life cycle of the product • interested manufacturers apply and submit test data and then they also pay an application and annual licensing fee • targeted at the domestic sector

Table A.1: Endorsement labelling programmes
Source: Casey-McCabe & Harris (1995)

Labelling programme	*Focus/objectives of the programme*	*Characteristics of the programme*
Energy Guide- US government programme	to ensure the effective communication of energy usage of labelled products Outcome: the labels have not been effective in helping consumers to identify models that are truly energy efficient	• mandatory compliance • targeted at domestic sector and climate control • for domestic appliances the energy guide label addresses the estimated yearly energy cost to operate the product and for climate control products numerical rating (energy efficiency rating) of energy use is given in the label
Energuide- Canadian government programme	To help consumers choose efficient home appliances To protect the environment through reducing electricity demand To help consumers spend less money on electricity	• the programme is part of the federal Green Plan dealing with the threat of global warming and other environmental impacts that result from energy use • mandatory compliance • Energuide had got a directory published annually
European Community energy labelling- European Community programme European Community energy labelling- European Community programme	To provide consumers with 'better opportunities' for selecting efficient appliances to enable consumers to compare To encourage manufacturers to manufacture higher efficient appliances Outcome: 70% to 85% of customers' response was positive because they noticed the label and it was easy to understand The label seemed to also increase consumers interest in energy consumption This also resulted in an increase over sales of efficient appliances	• the household appliances on sale will be labelled to show energy consumption and of that model • mandatory compliance • targeted at households • the labels will contain energy efficiency rating using the letter A with a green arrow to G, energy consumption and star labelling • sales people were involved in marketing and promoting the appliances
National Fenestration rating council- US public and private joint venture (government, fenestration and building industries, utilities and consumer groups)	To establish fair, credible and uniform system for fenestration products (windows, doors, skylights, etc.) To have uniform systems for comparison by consumers and builders and this will enable them to make informed decisions Outcome: has had an impact on the manufacturing industry transforming- as they are producing more efficient products because of the high demand in the market for efficient fenestration products	• the programme uses numerical ratings to compare products • voluntary compliance • targeted at builders and consumers • manufacturers pay a fee for testing and evaluation of their products
Scientific certification systems- USA multi-disciplinary independent scientific organisation	To promote environmental sustainability in product planning, design management and production	• product comparison programme with focus on the environment impact • uses "environmental report card" • a fee is paid for their service and it certifies the products

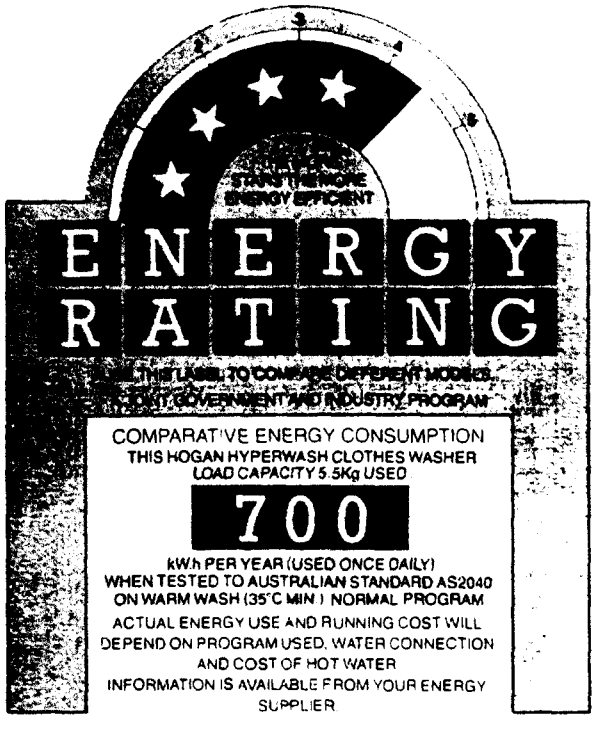
Labelling programme	*Focus/objectives of the programme*	*Characteristics of the programme*
Scientific certification systems- USA multi-disciplinary independent scientific organisation	To educate the consumers about the environmental effects of products and lifestyle choices that consumers make To provide consumers with information about the environmental profile of products	

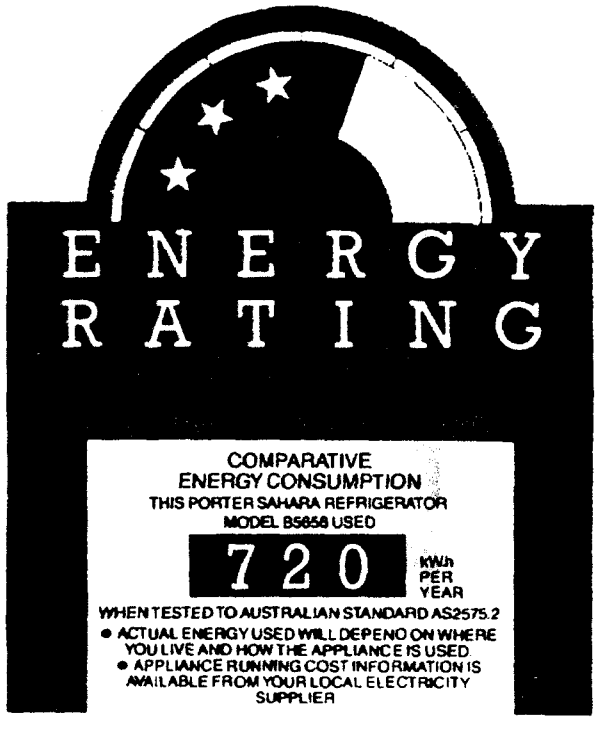
Pirkey et al 1994: 9.257

Table 2.2: Comparison labelling programmes
Source: Casey-McCabe & Harris (1995)

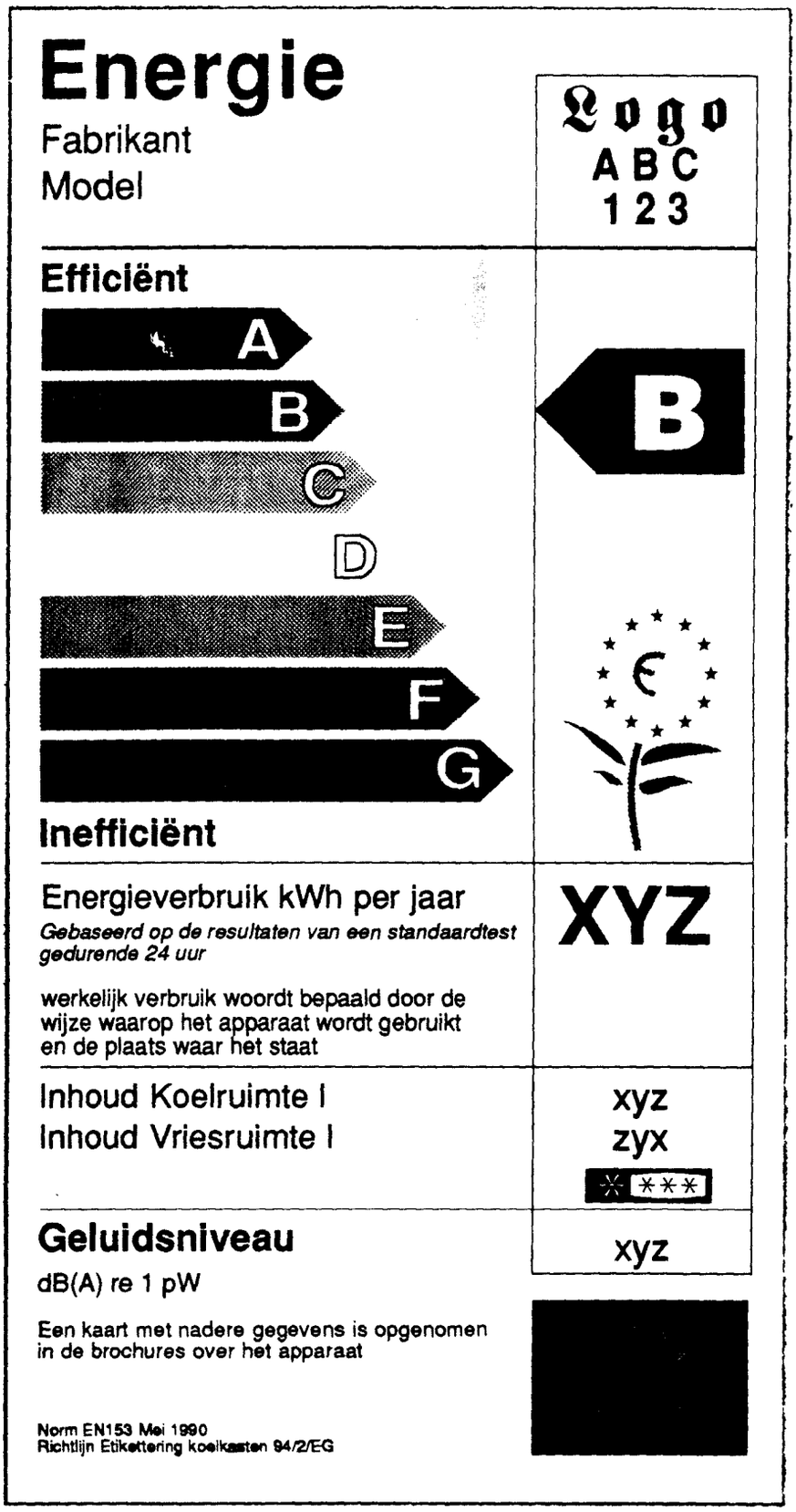
Appendix 2
Examples of appliance labels

1. Australia

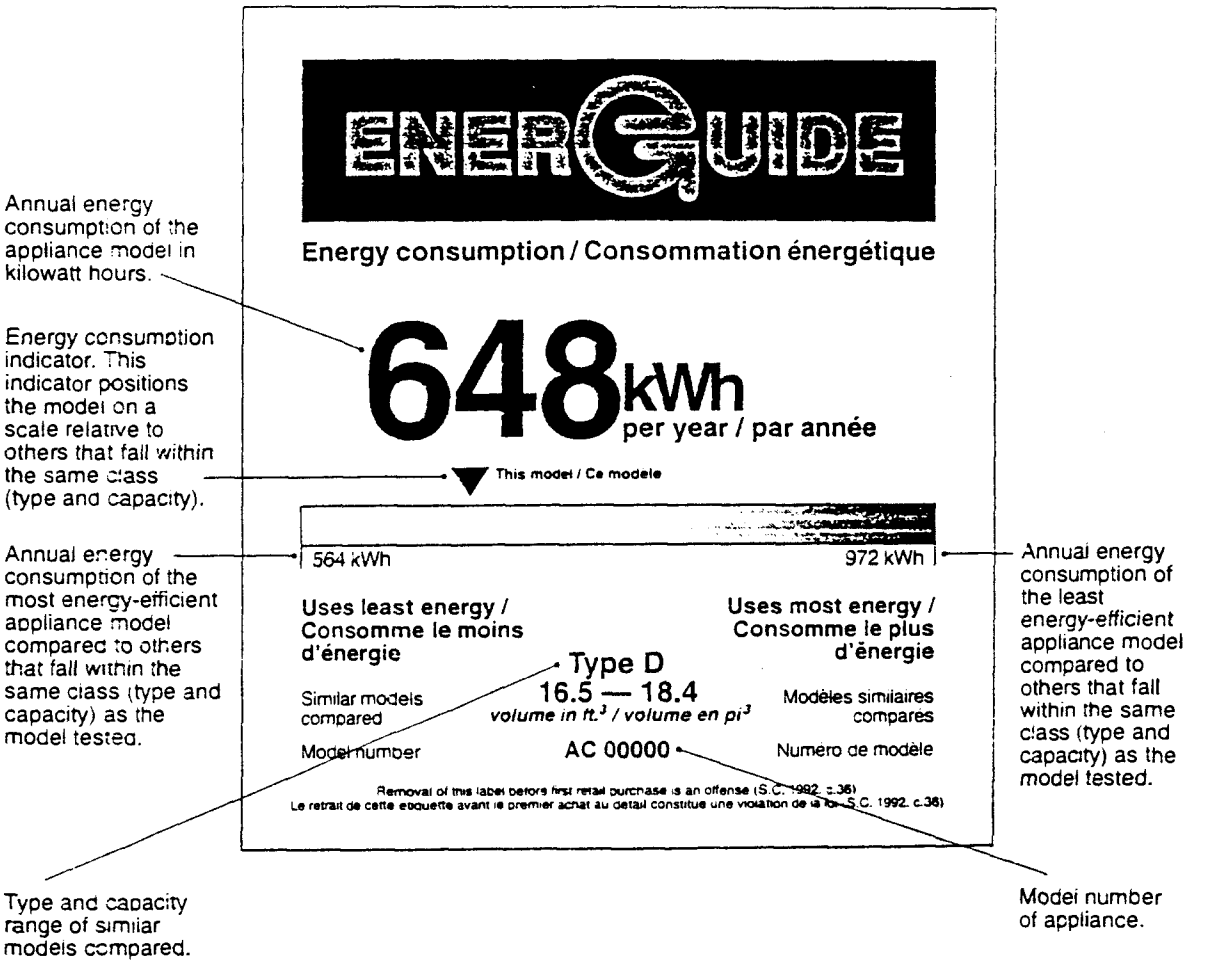




2. Netherlands



3. Canada


ENERGUIDE
Energy consumption / Consommation énergétique
648 kWh
per year / par année
This model / Ce modèle
564 kWh
972 kWh
Uses least energy / Consomme le moins d'énergie
Uses most energy / Consomme le plus d'énergie
Type D
Similar models compared
16.5 — 18.4
volume in ft.³ / volume en pi³
Modèles similaires comparés
Model number
AC 00000
Numéro de modèle
Removal of this label before first retail purchase is an offense (S.C. 1992, c.36)
Le retrait de cette étiquette avant le premier achat au détail constitue une violation de la loi (S.C. 1992, c.36)
Annual energy consumption of the appliance model in kilowatt hours.
Energy consumption indicator. This indicator positions the model on a scale relative to others that fall within the same class (type and capacity).
Annual energy consumption of the most energy-efficient appliance model compared to others that fall within the same class (type and capacity) as the model tested.
Annual energy consumption of the least energy-efficient appliance model compared to others that fall within the same class (type and capacity) as the model tested.
Type and capacity range of similar models compared.
Model number of appliance.

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APPROVED

ETL VERIFIED

UL

Warnock Hersey

CSA

Verification marks currently recognized by NRCan.

4. United States of America

Based on standard U.S. Government tests

ENERGYGUIDE

Water Heater—Natural Gas
Capacity (first hour rating):
60 gallons

XYZ Corporation
Model(s) RP23,
RP 38

Compare the Energy Use of this Water Heater with Others Before You Buy.

This Model Uses
240 therms/year

Energy use (therms/year) range of all similar models

Uses Least Energy	Uses Most Energy
245	295

The Estimated Annual Energy Consumption of this model was not available at the time the range was published.

Therms/year is a measure of energy use. Your utility company uses it to compute your bill. Only models with first hour ratings of 58 to 64 gallons are used in this scale.

Natural gas water heaters that use fewer therms/year cost less to operate. This model's estimated yearly operating cost is:

$140

Based on a 1992 U.S. Government national average cost of $0.58 per therm for natural gas. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Removal of the label before consumer purchase is a violation of Federal law (42 U.S.C. 6302).