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An investigation into sector designation, prescribed in the Preferential Procurement Policy Framework Act (PPPFA), as a policy instrument for broadening the Transformer industry's industrial base

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Abstract

The paper identifies that due to the historic evolution of the South African economy, particularly the emphasis placed on energy provision as a catalyst for successful mineral extraction; the seeds were sown for South Africa to be an industrial hub in transformer manufacturing. However, this opportunity has not been realised. Domestic transformer manufacturers have continued to lose market share both domestically and globally. The research identifies a lack of demand, locally, for domestically manufactured transformers as an inherent cause of the challenges faced by the local transformer industry. This lack of demand is also recognized as the reason constraining the potential growth of the industry. The paper identifies a virtuous cycle between capacity utilization and expansion, wherein; higher capacity utilization favourably influences price competitiveness, which increases market share and induces investment into additional capacity. As greater market share is

attained due to price competitiveness, even higher capacity utilization is achieved; therefore further inducing investment on the expanded capacity and the cycle continues with further expansion. The paper investigates sectoral designation as an industrial policy instrument to achieve this model, that is; increase demand, capacity utilization and ultimately broaden the industrial base of transformer manufacturing. The paper advocates that, while growing in the export market is the ideal end point, the industry would grow its current production capacity threefold if it were provided the opportunity to fully satisfy domestic demand[1]. As a result, this should be the first market to conquer. It is also identified in the research that sectoral designation as a policy instrument is not without shortfalls, particularly given the unique characteristics inherent in the transformer industry. The paper concludes with policy recommendations to overcome the identified shortfalls and proposes a model for consideration.

This dissertation is submitted for the completion of a Master of Commerce in Development Theory and Policy degree. I would like to express utmost gratitude to Dr Paul Jourdan for his supervision, guidance and valuable contribution in the preparation of this research report.

[1] Between the period 1998 and 2015 - Total imports (true demand of the grid); 2 189 531 divided by domestic production capacity (full capacity); 722 456 = 3. Assumes no exports

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1) **Introduction**

One of the fundamental problems of the South African economy is that it is too large in certain areas, for example; mining and the financial sector, while at the same time, too small in others, for example; the engineering sector. While the country enjoys a relatively more advanced industrial sector, relative to African peers; even earning the coveted title of "Africa's most Industrialised Economy", in those aspects where the economy is too small, an infant industry argument can be made for these industries. However, due to World Trade Organization (WTO) treaties signed by South Africa, protecting these industries via tariff protection is not an option. Additionally, as the global integration deepens, it would be ill-advised to tread contra to this trend.

Within in this context, competition for market share in the transformer industry, between local and international manufactures is increasing. Local manufacturers have in the recent years continually lost market share to their international competitors. A drop in tariff barriers owing to the WTO commitments has led to a significant increase in imports. In addition, government subsidies for manufacturers in trade partner countries, such as; India, China and South Korea, have made it difficult for South African transformer manufacturing companies to compete against these foreign manufacturers.

Domestic production rigidities, particularly related to input costs and conflicting policies have compounded the challenge faced by the domestic transformer industry. In addition, a lack of demand, locally, as a result of Eskom and the Municipalities opting for imported transformers over locally manufactured transformers has further placed the sustainability of the domestic industry under server strain.

Since 2012, the domestic transformer manufacturers have lobbied the Department of Trade and Industry (DTI) for the designation of transformers. The lobbying efforts were triggered by revelations of the Ethekwini Municipality importing their transformers, after a tender was awarded to a foreign company over all the domestic companies that submitted bids. This has resulted in on-going lobbying by industry to government between 2012 and 2015. However, during this period a total of 375 066 transformers were imported country wide, while the domestic industry produced 112 136, at an average capacity utilization rate of

76%. In this period alone, the opportunity cost, assuming the local industry had been operating at full capacity is 26 912 transformers or R 2.3 billion.

Notwithstanding these challenges, the transformer industry is faced with significant opportunity as a result of the large infrastructure programs that are being undertaken by Eskom, the municipalities and neighbouring African countries. This presents an opportunity for industrial policy to step in and take advantage of the prospect to re-industrialize the transformer industry.

The South African government has at its disposal a variety of industrial policy tools which it currently draws on in an attempt to develop the manufacturing capability available in the country, these include; supplier/enterprise development initiatives, manufacturing enhancement programs, competitive supplier development programs, to name a few. This paper examines the potential for success of sector designation as an industrial policy instrument in the transformer industry.

The Preferential Procurement Regulations of 2011 make provision for the DTI to designate sectors in line with national development and industrial policies for local production.

The designation regulations enable all organs of state to include, as a specific tendering condition, that only locally produced services, works and manufactured product with a stipulated minimum threshold for local production and local content will be procured by any organ of the state and public entity (DTI, 2011).

The research advocates that designation will not only indigenise intellectual capital by creating a degree of demand certainty, but will also generate growth across industries feeding into the transformer industry. The transformer manufacturing industry presents a number of unique characteristics that have to be considered in examining the potential for success of designating this industry, these include;

- The complexity and advanced level manufacturing/engineering required in transformer manufacturing and the skills constraint South Africa faces. This has, to an extent, resulted in even some of the ‘domestic manufacturers’ outsourcing the design and complex engineering and using South Africa as an assembly destination.

- Raw material scarcity, as raw material suppliers have scaled down domestic operations due to weak domestic demand for raw materials. From the perspective of raw material producers, the reduction in demand for the raw materials is partly a function of the importation of fully manufactured transformers, in which these raw materials would have gone into.
- Dominance of foreign manufacturers over the local industry and policy makers. This dominance is a function of the international expertise these companies employ and their capability to deliver orders, in budget and on time. This introduces the political economy aspect to the transformer industry, from the perspective of where power and influence lie
- Domestic production rigidities, production costs, labour instability to which domestic manufacturers are exposed to.
- The urgent nature and need to resolve the South African energy crises, Eskom and municipalities have raised their reservations about the designation of transformers citing;
    - The inability of local manufacturers to meet the demand at the urgent pace required
    - The premium local manufactures would price into the price of transformers as a result of the protection that designation would afford them.
    - The urgent nature of the electricity crises in South Africa needs for all available resources (local and international) need to be pooled together and fully employed, in order to sufficiently respond to the crises at hand.

These various aspects have made the designation of transformers very challenging, and will in turn be dealt with in the research.

The research paper is structured as follows; sections 2 and 3 are introductory, with section 2 introducing transformers and their role in the energy provision process, and section 3 introducing the transformer industry and dynamics underpinning it. Section 4 deals with the theoretical aspects underpinning this research, namely; industrial policy and the importance of manufacturing. Section 5 introduces designation, the policy instrument and its facets,

while section 6 deals with the methodology used in the research. Section 7 is a detailed sectoral analysis of the transformer industry. Section 8 brings the policy aspect and the sectoral analysis together in presenting findings and policy recommendations. Section 9 presents the model as advocated for by the research, while section 10 concludes the report.

2) **Transformers**

Transformers form an integral part of electricity distribution value chain. Broadly, the electric energy delivery process entails generation, transmission and distribution of electric energy. The transformer industry constitutes part of the transmission and distribution portion of the value chain.

The process is initiated at the generation phase, in which electricity is produced at power stations across the country. The electric current that is produced at the generation phase has a voltage that is too low to transmit over long distances. Transmitting electricity at high voltages reduces the load loss and as a result, this voltage has to be increased in order to ensure efficient transmission with minimal losses.

In transferring the electricity from the point of generation to the nearest grid, the voltage is increased by 'step up transformers'. The electricity is then transmitted to the provincial or municipal grid via a 'step up' or a 'step down' transformer.

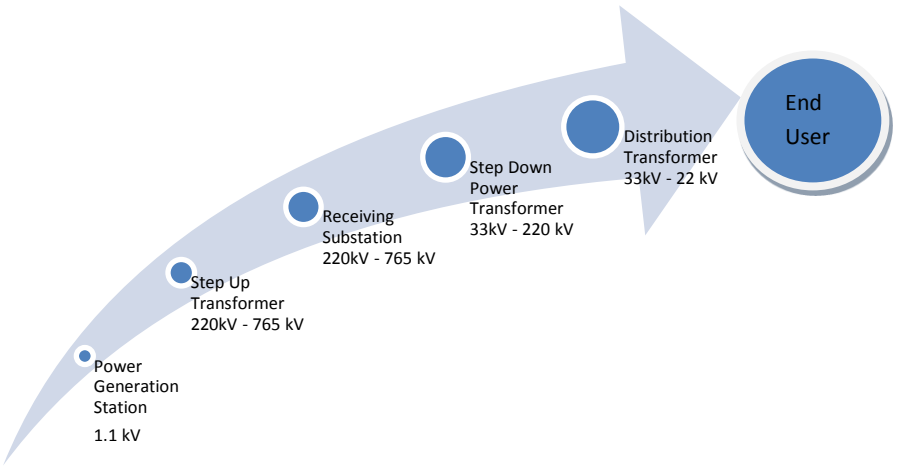
The increased voltage that is requisite to ensure transmission with minimal losses is however not suitable for consumption by final consumers. The voltage has to be lowered for the purpose of sub-transmission and distribution for end consumption. The voltage is decreased via a 'step down transformer' and the electricity is then transmitted into a power substation. Subsequently, distribution transformers are used to transmit power from the substation to the end consumer, at a voltage suitable for consumption at that level of use.

Transformers enable the essential changes in voltage across this distribution chain, and due to the fact that different voltage levels are required at different phases of the network, the objective is to transfer large amounts of alternating voltage electricity over long distances with minimum losses and at the least cost.

Power transformers have shaped the electricity supply of industry, permitting generation to be located remotely from points of demand (Kohler, 2011).

Figure 1, below depicts the process involved in the distribution of electricity from generation to end consumption. The figure summarises the process particularly focusing on the role of transformers in the process[2]. The combined transmission and distribution network, when all other aspects contributing to electricity distribution value chain are included, is referred to as the 'power grid'.

Figure1; Electric Power Distribution (Generation to End Consumption)



(CRISIL, 2011)

In South Africa, Eskom the country's electricity utility is the most significant source of demand for transformers. The utility produces 90% of the power used in the country.

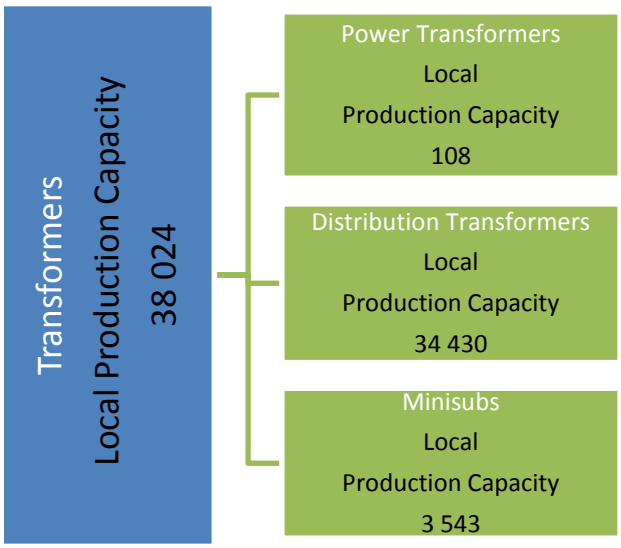
Eskom has a fleet of approximately 120 major transformers at its power stations country wide. It also has 399 transmission transformers in service and 343 970 distribution transformers in operation (Soverall, 2012). In 2015, the utility had a transmission transformer capacity of 125 620 MVA and a distribution transformer capacity of 102 444 MVA.

The average life span of a transformer is 25 years (Asit C. Mehta Ltd, 2010). The demand for transformers is twofold; the demand for new capacity installed as a result of an expanding power grid and the replacement of transformers at the end of their life cycle.

[2] KV: is a measure of the voltage in a unit of electric current. A higher numerical value is indicative of higher voltage in the electricity, while a lower numerical value is indicative lower voltage in the electricity.

The following figure provides a breakdown of the transformer categories that constitute the transformer industry. The figure also indicates the domestic production capacity of the local industry, measured in number of units of transformers.

Figure2; Transformer Categories and Domestic Production Capacity



Source: SEIFSA

3) **South African Transformer Industry**

The development of the South African transformer industry has its roots firmly entrenched in the historic evolution of the South African power industry, which in turn also has roots engrained in the Mineral Energy Complex, a concept developed by Fine & Rustomjee in a 1996 study on the political economy of South Africa. The ownership structure of the domestic power grid has also contributed to both the development and the structural trends underpinning the transformer industry.

In introducing the transformer industry, it would be judicious to do so by explaining the industry in its relation to these three aspects, namely, the South African power industry, the Mineral Energy Complex; which addresses the political economy elements of the industry, and lastly, the domestic power grid and its ownership.

a) South African Power Industry;

The development of the South African economy was to a great degree influenced by the energy sector, that is, the emphasis the country placed on the importance of having sufficient and reliable energy as a catalyst for growth.

As the technology of electrical energy spurred globally in the late eighteen hundreds, South Africa was one of the first countries in the world to adapt to the technology. Two years after the invention of the incandescent lamp in 1879, the first electric lights were installed at the railway station in Cape Town. A few years later, and in the same year the world's first central power station became operational in New York, the first electrical street lights were installed in the mining town of Kimberly, well ahead of London which at the time was still using gas lamps (Eberhard, 2002).

The importance of electricity as a catalyst for the growth of the South African economy, that is, the importance of energy as a prerequisite for the successful exploitation of the mineral wealth existing in the country was well appreciated by South Africa. Evidence of this is well supported by the haste, in which investment was channelled into developing electrification capacity in the country. By 1897, the first commercial central power station was built, and the electricity industry expanded quickly across the country.

The boom in mining exploration in South Africa created a natural environment for the expansion of the electricity industry. The industry expanded quickly, spurred by the capital being invested in mining. The first commercial power station was built to supply the gold mines around Johannesburg, however, over the next two decades; various mines built their own power stations for powering operations and supplying electricity to neighbouring towns, for some.

In 1920, the concept of connecting individual power stations into a single network begun to be considered, as well as the electrification of the railways and adjacent towns (Eberhard, 2002). This suggests an important milestone for the transformer industry in South Africa, as the formation of a national power grid and the need to transmit electricity over long distances, from the point of generation to the end user requires the contribution of transformers to the value chain.

Over and above the mining activity, the ensuing decades coincided with the South African government of the day adopting an industrialization approach of promoting the development of iron and steel, ferro alloy and aluminium industries, all of which are by nature very energy intensive industries and require the availability of cheap and abundant electricity. Further to that, the oil crises of the 1970's highlighted the need for the economy to be more reliant on electricity.

These dynamics motivated the investment case for the power sector, making it an unquestionable choice for continuous investment into the growth of the sector. Expansion in generation capacity naturally required the expansion in the distribution and transmission capacity of the power grid, and consequently the expansion of the transformer industry, as the need to transmit electricity from point of generation to the end consumers grew.

The heightened activity and investment into the power sector attracted a significant amount of local and international capital to either set up new domestic transformer manufacturing capacity or buy into operations that already existed. Examples include; ASEA Sweden, which subsequently became ABB, bought into a local transformer manufacturer Besaan's Engineering in 1944. Over the years a great deal of corporate activity, buy-outs and mergers have occurred subsequent to this initial deal, resulting in the present day PowerTech Transformers, a local Original Equipment Manufacturer (OEM) of various ranges of transformers, with relatively stronger expertise in power transformers. Conversely, in 1967, General Electric Company set up new transformer manufacturing capacity under the name General Electric South Africa. Similarly, succeeding the establishment of the initial operation, a significant amount of corporate action has taken place over the years, resulting in the present day Actom, also a local OEM offering a variety of transformers, with relatively strong capability in distribution transformers.

The two examples cited characterise the general profile and type of investment activity that took place over the historic period of the transformer industry. A great deal of corporate action has taken place over this historic timespan, to arrive at the present day industry

which boasts 17 domestic transformer manufacturers[3] that constitute a total production capacity of 38 024 transformers across the various categories and sizes.

b) Mineral Energy Complex

The Mineral Energy Complex is a concept developed out of analysing the South African political economy. The implications of the analysis and conclusions drawn, are however not solely unique to South but can be applied to other economies, particularly those economies whose development path is underpinned by resource extractive industries.

The MEC is a system of capital accumulation characterised by a group of industries associated with large scale mineral extraction and energy provision. The 'complex' as a set of industries is not limited to the two aforementioned, but includes all other downstream industries that can be categorised as contributing toward an enabling environment, for the success of the complex. An example would include; a strong and efficient financial sector that would ensure successful debt and capital rising, and the provision of highly developed financial solutions for all the industries involved in the complex. Specific to this research, the applicable example is extended to a reliable and well-functioning power grid, which in turn includes a well-resourced and highly capable transformer manufacturing industry.

If mapped out, the core MEC industries include those industries closely linked with energy provision supplied predominantly through increasing coal extraction and with mining absorbing a large proportion of the energy supplied (Fine & Rustomjee, 1996).

At its core the MEC is an approach analysing economic development from the focal point of a system of accumulation, therefore allowing the analysis to take into account a specific world historical context (IIPPE, 2014). This is different from alternative economic development approaches that either; prescribe policy because it has been successful elsewhere, or because they promote certain self-interests.

Within the MEC system of accumulation, the analysis identifies important outcomes that are important to this research. The overarching argument advanced by the analysis is that, the MEC as a system of accumulation prevented the diversification of the manufacturing sector, by solely placing focus on the core MEC industries, and thus retarded the industrialisation

[3] List of the 17 companies provided in Annexure 1 of this Research Report

path of the South African economy. The implication is that there exists tension between the principal MEC and non- MEC related manufacturing industries, reflected in government policy, access to and distribution of investment (IIPPE, 2014).

The broad set of conclusions of the MEC analysis have extensive implications for the South African economy, however, the primary focus for this thesis, is to extrapolate the fact that the transformer industry can be regarded as one incorporated in the MEC, and therefore one that would have been a beneficiary of the system of accumulation.

c) Ownership of the Power Grid

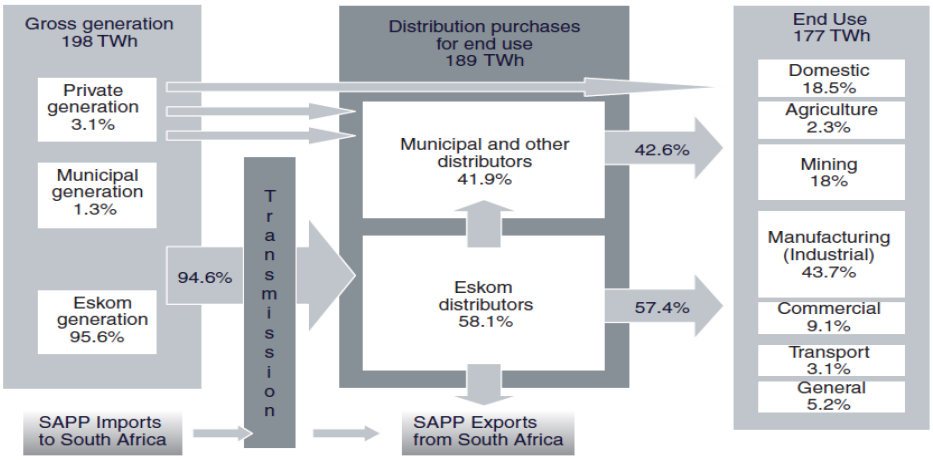
An important aspect influencing the transformer industry and one that also provides insight in introducing the transformer industry is the ownership structure of the local power grid. In the case of South Africa, the current ownership structure presents both important aspects for consideration and unique opportunities, in respect of the potential success and/or failure of the designation of the transformers industry.

Eskom Holding is the largest producer of electricity in South Africa. The utility also has the largest production capacity in Africa, and according to its 2011 financial statements, it is one of the top seven electricity utilities in the world in terms of generating capacity (Eskom Holdings, 2011).

The utility is a vertically integrated company licenced to generate, transmit and distribute electricity (Eskom Transmission Group, 2014). It is therefore the responsibility of the utility to plan and develop the transmission and distribution network, a function which also entails the procurement of transformers, amongst other products.

The utility generates over 90% of the electricity used in South Africa (Soverall, 2012). Locally, Eskom owns, which entails that it also controls the transmission network, where it supplies about 60% of the generated electricity directly to end users. The balance of the electricity that is generated is distributed by 177 local municipalities that buy the electricity in bulk from Eskom and sell it on to the end consumers that reside and operate businesses in the respective municipalities. Some municipalities and businesses have generating capacity; however, this is very minimal relative to the overall capacity. Figure 3, below graphically depicts this detail.

Figure 3; Electricity Grid –Generation, Transmission and Distribution



Source: (Eberhard, 2002)[4]

The fact that Eskom, a state owned entity owns and manages the entire transmission and distribution network, has important implications for the success of industrial policy. Firstly, it centralizes the procurement source, and more important, is the fact that it is centralized under a state entity. It therefore allows for much easier coordination and monitoring of industrial policy initiatives.

Additionally, it allows for industrial policy to be direct into a target industry and the full impact realised, as opposed to industrial policy that has to rely on the probable success of second round effects. An example of the latter policy is the Broad Based Black Economic Empowerment (BBBEE) codes of good practice, wherein, compliance to the regulation is optional. Only companies that do business with the state have any incentive to comply with the policy regulation, and also enforce the regulation within their supply chain, in order to improve their scorecard. Outside of that, the policy has to rely on moral conviction, where the probability of success is decreases.

Lastly, it also brings to the fold the balance sheet of the state, which is significantly stronger than that which, an individual company or group of companies can attain. If the investment case is strong enough and the broader economic spinoffs are wide enough, the state can enter into an opportunity as an investment partner. This allows for significant scale, where

[4] SAPP – Southern African Power Pool

an opportunity of equal magnitude arises, for example, taking advantage of the transformer market on the African continent.

The important aspect to highlight from the historical development of the South African power industry and the dynamics underpinning the mineral energy complex in its encompassing of the transformer industry is the fact that, historically the seeds were sown for South Africa to be an industrial hub of transformer manufacturing, both on the African continent and even globally. This idea could even be extended to the wider product range of all products used in the electricity generation, transmission and distribution process. The ownership structure of the local power grid further cements this idea. However, as will be identified in the research looking into transformer industry, the opportunity has not been realized.

Given the current need to expand the South African power grid and the significant potential that exists in Sub-Saharan Africa, flowing from the greater attention by African governments on energy provision, there exists the potential for industrial policy, in the form of designation, to take advantage of this energy provision wave taking place locally and on the continent.

4) **Theoretical review**

This research is underpinned by two theoretical aspects, the first is; industrial policy, it advocates for the importance of industrial policy as important contributor to economic development. It stresses the role industrial policy can play in taking advantage of opportunity that exists for a sector which in turn translates to opportunity for the broader country, in light of the unique characteristics that are inherent in that economy. Secondly, the research advocates the importance of manufacturing as an engine for growth due to the special properties inherent in manufacturing, in the specific case of this research, transformer manufacturing.

a) Industrial Policy

Steering the developmental process of any industrial base requires strong and well throughout industrial policy. It is an important subject which has raised numerous debates around what is, or is not the correct policy response or action.

(Chang, 1994), defines industrial policy as policy that is aimed at particular industries (and firms as their components) to achieve the outcomes that are perceived by the state to be efficient for the economy as a whole.

Industrial policy has also been described as the official strategic effort to encourage the development and growth of the manufacturing sector of the economy (Bingham, 1998).

An UNCTAD and UNIDO report (2011), the government takes measures "aimed at improving the competitiveness and capabilities of domestic firms and promoting structural transformation.

There is a growing consensus in recent development theory that state interventions are often necessary when market failures prevail (Rodrik, 2009). Market failures often exist in presence of externalities and natural monopolies. These market failures hinder the emergence of a well-functioning market and corrective industrial policies are required to ensure the allocative efficiency of a free market (Rodrik, 2009).

In practice, interventions are aimed at regulating networks, public infrastructure, research and development or correcting information asymmetries. While the current debate has shifted away from dismissing industrial policies overall, the best ways of promoting industrial policy are still widely debated (The Donor Committee for Enterprise Development, 2012)

One aspect of this debate is whether governments should use industrial policies to make the most of their country's current comparative advantage, or instead invest in higher-productivity industries that are not competitive in the short-term (Donor Committee for Enterprise Development, 2014). According to a (World Bank , 2010) report, industrial policies fail due mostly to government's inability to align their efforts with their country's resource base and level of development. The report suggests that developing countries should first seek to profit from the (mostly labour- and resource-intensive) products and services that they are currently most competitive in. They will accumulate human and physical capital in the process. This capital can be reinvested over time in more productive industries (World Bank , 2010).

In contrast, (Chang, 1994) argues that developing countries should defy their comparative advantage. (Chang, 1994), argues that the cost of moving capital between industries (e.g. from sewing machines to car plants) means that countries should actively promote high-productivity industries at an early stage in their development (Donor Committee for Enterprise Development, 2014).

Based on empirical analysis of 20 developed countries, a report by the (McKinsey Global Institute, 2010) supports the World Bank view that industrial policymakers should care more if an industry is competitive, than if it is high-tech.

b) Importance of Manufacturing

Broadly the manufacturing sector is a very important sector to any economy. Classical development economic literature, as first developed by Nicolas Kaldor in 1967, regards manufacturing as having 'special properties' which make it especially important as an engine of sustainable growth.

Nicholas Kaldor was one of the first to consider the role of increasing returns in economic growth. Contrary to endogenous growth theory and its focus on supply side issues, Kaldor's perspective emphasised the importance of the exogenous components of demand in explaining economic growth in the long run (Libanio, 2001)

While neoclassical economics is entirely based on the supply side, Kaldor's growth law is based on both the supply and the demand side. According to Kaldor's theory, the income elasticity of demand for manufacturing goods is much higher than that of, for example, an agricultural good, this is the demand side of Kaldor's law (Ener & Arica, 2011). On the supply side, Kaldor asserted manufacturing as having a greater potential for productivity growth (Dasgupta & Singh, 2006), (Ener & Arica, 2011).

His literature has generally been regarded as heterodox in nature and referred to in broad terms as the Kaldorian tradition. In it, Nicholas Kaldor develops three stylized laws of growth of which he developed through the examination of cross sectional data from developed countries between the periods 1952-54 and 1963-64. The laws have been the basis on which much of the available economic growth literature has been developed upon and debated.

In Kaldor's first law, he identifies that there is a close relation between growth of manufacturing output and the growth of Gross Domestic Product (GDP). Kaldor's first law can be summed up in the expression that 'manufacturing is the engine for economic growth' (Libanio, 2001).

This can be alternatively stated in terms of GDP growth being faster the greater the growth in industrial output relative to GDP: that is when the share of industry in GDP is rising.

Additional evidence supporting the statement "manufacturing is the engine for economic growth", Kaldor put forward the notion that growth in non-manufacturing output also responded positively to growth in manufacturing (Libanio, 2001).

(Libanio, 2001), argues that the correlation between growth in manufacturing output and growth in the overall economy can be explained by the fact that growth in the former results in growth in the productivity of the economy and that there are two possible reasons for such effects. Firstly, it relates to the fact that the expansion of manufacturing output and employment leads to the transfer of labour from low productivity sectors to industrial activities that present higher productivity levels. The outcome is in the increase of overall productivity in the economy and little or no negative impact on the output of the traditional sectors, given the existence of surplus labour (Libanio, 2001). Kaldor, referred to this process as the transition from "immaturity" to "maturity", where he defined the immature economy as one in which there is a large amount of labour available in low productivity sectors that can be transferred to industry.

The second reason for the relation between manufacturing growth and productivity relates to the existence of static and dynamic increasing returns in the industrial sector (Libanio, 2001). He argues that static returns relate mainly to economies of scale internal to the firm, whereas dynamic returns refer to increasing productivity derived from learning by doing, induced technological change, and external economies in production (Libanio, 2001).

Kaldor's second law posits that there is a positive relation between the growth rate of labour productivity in manufacturing and manufacturing output growth. He argues that manufacturing productivity growth triggers output growth in manufacturing through the returns to scale known as Verdoorn's law. Verdoorn's law provides evidence of the

existence of increasing returns to scale within the industry (Ener & Arica, 2011). (Verdoorn, 1949), proves the presence of the positive relationship between labour productivity growth and output.

According to Verdoorn's law, faster growth in output increases productivity due to increasing returns. (Verdoorn, 1949), argued that in the long run a change in the volume of production, by about 10 per cent, tends to be associated with an average increase in labour productivity of 4.5 per cent. The Verdoorn coefficient close to 0.5 is also found in subsequent estimations of the law. (Nicholas, 1966), reported a 0.484 coefficient in testing the theory.

It is important to highlight, that though the laws are individually stated in a manner that appears to imply a direction of the relationship between growth of manufacturing output and the growth of labour productivity, the relationships stated in both Kaldor's second law and Verdoorn's law are statistical in nature, and not causal. The latter would imply a direction of the relationships.

The fundamental argument is that an initial growth in output induces productivity gains that allow for the reduction of unit labour costs and, given a mark-up pricing rule, for fall in prices, increasing the competitiveness of a country or region. These gains, in turn, allow for further output expansion through increasing exports, which reinitiate the cycle (Libanio, 2001). Libanio, concludes that once a country or region acquires a growth advantage, it will tend to keep it through the process of increasing returns and consequent competitive gains that growth itself induces.

(Pons- Novell & Viladecans-Marsal, 1998), presented an alternative and concise explanation, in stating that industrial growth in output causes growth in productivity that allows for fall in production cost and in prices, increasing the competitive edge of a country.

(Mamgain, 1999), introduced an interesting view when explaining the reason as to why productivity increases in the manufacturing sector. He does so by linking Kaldor's second and third laws. He argues that Verdoorn's model assumes that wage rates are positively

related to productivity. Increased productivity would imply higher wages which results in decreased labour use.

However, according to Kaldor's third law surplus labour in non-manufacturing sectors, keep the wages from rising in the manufacturing sector when productivity increases. Increased labour demand in the manufacturing sector would decrease surplus labour in the nonmanufacturing sector, so productivity would increase.

Kaldor's third law states that manufacturing growth induces productivity growth. As alluded to above, surplus labour in the non-manufacturing sectors keeps the wages in the manufacturing sector from increasing as productivity increases. Increased labour demand in the manufacturing sector decreases surplus labour in the non-manufacturing sector, so productivity increases (Mamgain, 1999).

Kaldor's third law can be summed up to suggest that there is a positive relationship between overall productivity growth and manufacturing output, although overall productivity growth is related negatively to employment in non-manufacturing sectors.

Several authors have empirically tested the Kaldorian theory to establish its relevance and applicability in modern day economies and outside of the developed world context, as from the roots it stemmed in the work of Kaldor.

(Libanio, 2001), tested the Kaldorian view for the largest economies in Latin America during the period 1985 – 2001. They empirically test only the first two laws of the Kaldorian theory. Their results support Kaldor's views on the importance of the manufacturing industry for economic growth.

(Ener & Arica, 2011), test the relevance of the Kaldorian laws on high income countries. Their work investigates the relationship between industrial growth and economic growth. They estimate Kaldor's first law for a sample of 23 OECD countries that have high incomes over the period 1980 to 2008. The empirical analysis, confirms Kaldor's first law accepting the hypothesis that manufacturing is the engine of growth. However, they also find that with high income countries, the result is not religiously the norm; there are varying degrees to which the hypothesis holds.

Manufacturing also has positive spill over effects on the services sector. (Tregenna, 2008), suggests that growth, increasing sophistication and specialisation of manufacturing may generate increased demand for service inputs into manufacturing. To the extent that services grow as a result of this, such a shift in the composition of the economy should not be interpreted as services replacing manufacturing, as the shift is associated with an increased demand rising from manufacturing itself.

In terms of economy wide multipliers, (Tregenna, 2008) identifies that an additional unit of final demand for manufacturing would require more inputs from other sectors than is the case, for example services, suggesting that the growth in manufacturing would have a greater stimulatory effect on the economy as a whole than an equal increase in final demand for services. Conversely, a decline in the manufacturing sector would deprive the services sector of an important source of demand, both direct and indirect (Tregenna, 2008).

5) **Designation**

One of the fundamental problems with the South African economy is that it is too large in certain aspects, for example the mining and the finance industries, while at the same time being too small in certain respects, for example, industries involved in complex engineering. For the industries that can be considered as small, an infant industry argument can certainly be extended to these industries. However, trade protectionism as a form of industrial policy is both not possible and practical for a number of reasons. These reasons include; the fact that South Africa is a signatory to international trade treaties and therefore is bound to the regulation prescribing the allowable levels trade protection. It cannot simply adjust trade tariffs at its own behest. Similarly, in a world where the general trend is toward greater integration, it would be ill-fated to tread in a direction that is contra to the trend.

It is incumbent on industrial policy to operate within these constraints. Industrial policy that is context specific for South Africa, and can even be extended to most African states, is one that seeks to increase the local content in products manufactured locally.

Sectoral designation as an industrial policy tool presents appealing characteristics in navigating through these constraints without contravening the trade treaties while at the same time still advancing and contributing toward the global integration agenda. Importantly, sectoral designation brings together the strength of public procurement and local content regulation into a single industrial policy instrument.

The Preferential Procurement Policy Framework Act (PPPFA) was enacted by the South African government in 2000 and its initial regulations promulgated in 2001. The purpose of the act is to enhance the participation of Historically Disadvantaged Individuals (HDI's) and the Small Medium and Micro Enterprises (SMME's) in the public sector procurement system (National Treasury, 2011). In 2011, revised regulations were promulgated, consequently repealing the regulations of 2001.

Section 9 of the revised regulations makes provision for the Department of Trade and Industry (DTI) to designate sectors in line with national development and industrial policies for local production (National Treasury, 2015).

The designation regulations enable all organs of state to include, as a specific tendering condition, that only locally produced services, works and manufactured product with a stipulated minimum threshold for local production and local content will be procured by any organ of the state and public entity (DTI, 2011).

In designating industries deemed to have strategic national importance, the intended consequence of the policy instrument is the creation and retention of employment, while upscaling the industry and raising its competitiveness. Upscaling implies increases in both the volumes of products produced as well as value added locally, while competitiveness implies an increasing ability of the local industry to compete against imports and possibly move into export markets (DTI, 2011). The aspect of moving into export markets is the manner in which designation as a policy instrument contributes to the global integration agenda.

On the African continent, particularly Sub Saharan Africa, if executed well; South Africa can develop itself as the manufacturing hub for the region. An opportunity identified by

(Fesssehaie, 2014), who identifies that for the capital equipment industry, South Africa is a strategic platform to operate from in the regional market, both for South African and international Original Equipment Manufacturers (OEM's).

Conceptually, designation entails 'fixing up things at home', by way of increasing domestic demand. The increased demand will naturally attract additional investment into existing capacity in order to meet the higher demand. Concurrently, as greater capacity is created a strong springboard to take advantage of opportunities on the global market is also created, where additional scale can be attained therefore requiring additional investment into the already expanded capacity. A virtuous cycle is created as the process expands further.

An appealing aspect of designation as a policy instrument is its context specific characteristics for the South African economy and more narrowly, the local transformer industry. The latter, also presents its own unique characteristics that will be expanded on in this research. Broadly however, the motivations for designation include;

The demand certainty created in an industry. Transformer manufacturing requires a significant amount of upfront or expansion capital. The fabrication, drying ovens, testing equipment are all very expensive equipment and therefore companies would need a great deal of confidence that the volume potential would compensate for the investment made. The demand certainty through designation would undoubtedly attract both local and international investment.

A greater degree of local content would result in the reduced impact of currency fluctuation and therefore overall cost savings for state entities. This has particularly been evident in transformer manufacturing where at present approximately 50% of the input costs are exchange rate linked[5]. This was not always the case but has been increasing in recent years from approximately 20% to the present level. This is as raw material producers, namely aluminium and copper find the domestic operating environment to be very challenging and costly, coupled with low volumes. Designation presents the opportunity to reduce this reliance on imported raw materials, therefore reducing the currency risk. More importantly,

[5] Established in section 7d of this document

growth of a designated sector will result in the growth of associated sectors that feed into the designated industry, and possibly even the revival of others.

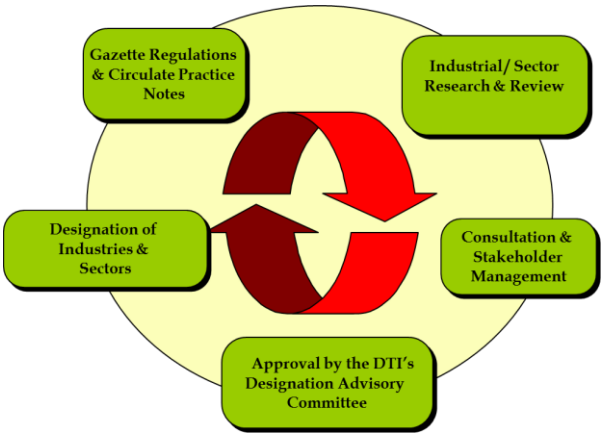
Cost savings can be derived from faster response times to varying demand, given the close proximity of local manufactures to their market. The same argument can also be extended to the proximity of domestic manufacturers and their African markets.

Designation ensures the consistency of supply in terms of the quality of the products manufactured. It grants a greater degree of authority in the hands of the South African Bureau of Standards (SABS) and South African National Standards (SANS) in developing specifications that are unique to South African dynamics.

a) Designation Process

The process of designating a sector is identified, in theory, as following the five step process contained in figure 4 below, commencing with the 'Industrial/Sector Research and Review' step.

Figure 4 Process of Designating Sectors



Source: DTI, 2013

In making the assessment for designation, the first step has two objectives, namely; to ascertain the significance of public procurement in relation to the industry and secondly, to understand the existing structure and capacity of the industry.

The first objective, that is, examining the extent of state procurement from that industry, has important implications for the success of designation in the transformer industry. The greater the existing or potential level of public procurement, the greater the impact designating the sector will have on employment and value added locally. In South Africa's case, the entire transmission and distribution network is owned by Eskom, a state owned entity, which effectively places the procurement of all transformers under state control.

The second objective addresses a greater amount of detail in quantifying aspects of the industry, namely, employment, turnover, value add, multipliers and capacity. Additionally, the assessment looks at the companies currently operating in the industry and their ability to sequentially scale up production in order to meet future demand. More importantly, this objective also addresses aspects of concentration, competition, including the identification of large, lead and dominant firms in industry. This can also be categorised as evaluating the political economy aspects of the industry in question.

The second step of the designation process entails consultation with stakeholders and stakeholder management. It is worth noting that this is the only step in which industry is directly and indirectly involved in the process. The process involves communicating the intention to designate a sector to all the affected and potentially affected stakeholders, with the view to solicit inputs or objection.

The last three steps, namely, three; Approval by the DTI's Designation and Advisory Committee, four; Designation of Industries and Sectors, and five; Gazette Regulations and Circulate Practice Notes, are generally procedural in nature. The greater deal of work is completed in the first two steps.

b) Designation policy levers

The primary policy lever employed in ensuring the success of designation is the use local content regulation. Local content regulations and adherence to them present an objective tool for accessing adherence to the policy regulation. Importantly, the DTI assigns power to the South African Bureau of Standards (SABS) to scientifically audit local content

specifications, therefore rendering non-compliance very difficult. This is in contrast to economic policy that relies on subjective reasoning in auditing compliance, for example, the Broad Based Black Economic Empowerment codes of good practice, where it is very difficult to expose fronting, because of the subjective interpretation of the codes.

c) Conditionality and Designation

The success of industrial policy cannot solely be attributed to the policy itself. While government support is justified in the presence of market failures, it cannot ensure competitiveness and efficiency by itself (Banda & Paremoer, 2015). The success of industrial policy is also largely dependent on the response and participation of the firms in the industry. This response and participation of the industry has, however, to be induced through policy instruments that work to discipline industry behaviour in the interest of competitiveness and efficiency, instruments which (Amsden, 2001), terms reciprocal control mechanism.

By definition, reciprocal control mechanisms are conditions attached to state support, namely; subsidies and incentives, and ensure that firms that receive such support 'reciprocate' through appropriate investment behaviour and performance (Banda & Paremoer, 2015).

Designation as a prescribed policy instrument has built into it RCM's in order to induce local industry to participate in broadening the benefit enjoyed through designation. For applicability, these RCM's have to be tailored to the particular industry being designated. They however, broadly include co-commitments from industry in the areas of; competitiveness upgrading, supplier development, investment, labour retention and expansion.

An additional general condition employed by the designation policy, is the right reserved by the Department of Trade and Industry to 'un-designate' a sector where there has been no progress made by the industry, with respect to their co-commitments and where anti-competitive behaviour takes place.

6) **Methodology**

This research has incorporated both quantitative and qualitative methodology.

Quantitative

The quantitative aspects of the research were undertaken in order to understand the historic trends and characteristics of the transformer industry. These include analysing; employment levels, value add, import/export statistics and production data. Section 7 of the report contains a detailed sectoral analysis of the transformer industry, wherein most of this information is utilised. The data analysis also assists in providing objective facts peculiar to the transformer industry in developing the policy recommendations suggested in section 8.

The reference period over which the data is analysed is 1998 to 2015, equating to 17 years. The starting year, 1998, is to a great degree influenced by data availability, where data on some of the variables is only available from 1998. For consistency and in order to standardize the data set, 1998 is chosen as a start.

In stances where comparative statistics between periods are provided, the 17 year data set is divided into 5 year periods as depicted in table 1 below;

Table 1; Categorisation of the reference period considered

Period	Relevance
1998 to 2002 Included	General optimism and relative stability. Although consideration is given to the fact that this period contains the Rand crisis of 1998 and 2001
2003 to 2007 Included	The period is categorised by strong economic growth and confidence in South Africa.
2008 to 2010 Excluded	Includes 2008/2009 global recession and distorts the trends
2011 to 2015 Included	Latest trends indicating the position of the industry

The comparative analysis compares period on period, for example 1998 to 2002 compared to 2011 to 2015.

The benefit of categorising the data in this format, particularly in light of the comparative analysis, is that; it eliminates outliers, base effects and the potential of drawing conclusions from single data points. Additionally, as is depicted in the table, this form of categorisation allows for broad themes to be associated with respective timeframes, and also makes the exclusion of particular periods possible. The period 2008 to 2010 is not included in the comparative analysis due to the global recession. The trends over that period are considered as outliers for the purpose of this thesis. Establishing the themes as contained in table 1 also provides insight into the sectors performance under particular economic conditions, which helps in broadening the context when 2 periods are analysed.

The data used in the analysis has been accessed through Quantec.

Qualitative

The Qualitative aspects of the research entail the interrogation of the designation policy as contained in the Preferential Procurement Policy Framework Act, of 2000 and all other legislation related to it. Additionally, reports, in the form of minutes of meetings, provided by the transformer industry documenting their attempts to get the industry designated are also analysed. The reports have been accessed through the Steel and Engineering Industries Federation of South Africa, the employer federation representing the transformer industry.

7) **Transformer Industry –Sector Analysis**

Energy provision and the role transformers contribute to the process of energy provision is essential in creating an enabling environment for economic growth and development. The prescribed special properties of manufacturing as a sector of an economy, namely, being an engine for economic growth, having an increasing returns to scale return profile and its greater potential for productivity growth, can be extended to transformer manufacturing. This further strengthens the case for the industry.

Despite the strong historic foundation set for the transformer industry in South Africa, the industry has continued to lose its productive capacity and consequently its market share both locally and in the Sub-Saharan African region.

Table 2 below, present's salient statistics about the transformer industry in 2015.The summary is presented in order to establish the order of magnitude of the transformer industry and its relevance to the broader South African economy.

Table 2 - Transformer Industry

Variable	**2015**
Transformer Market Size	R 3.1 billion (confirm)
Turnover (local producers)	R 2.5 billion
Employment (Formal and Informal)	11 765
Production (Units)	28 518
Domestic Capacity – units (all sizes)	38 024
Exported Units	5 346
Imported Units	38 898
Trade Deficit (Units)	(33 552)

Source: SEIFSA, (Soverall, 2012), Quantec, SARS Customs

The following section compiles a thorough sectoral analysis of the transformer industry, with the objective being to expand on the unique characteristics of the industry. Understanding these unique characteristics is an important step to informing the probability of success of designation as an industrial policy tool, and it also highlights important aspects for consideration when deliberating designation as a suitable industrial policy tool for this industry.

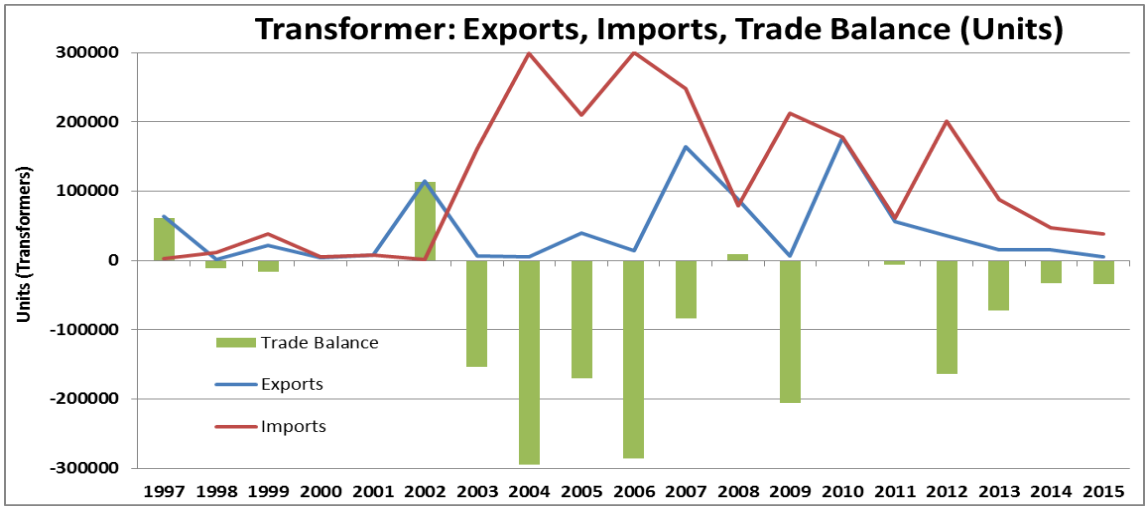
a) Import and Export Performance

The importation of transformers potentially presents the most credible threat to the sustainability of the local industry. The transformer industry has suffered a structural trade deficit (exports minus imports), in units, from the year 1998 to 2015, recording a cumulative trade deficit of 1.4 million units during this period. While the trend in the trade deficit has improved markedly, it has been a function of a decrease in imports and not an increase in exports, albeit imports are still at a very high level.

Graph 1 below, depicts the import and export statistics of transformers included under Harmonised System (HS) tariff code H85043400; *Transformers having a power handling*

capacity exceeding 500 kva (0.5 MVA). This also represents all the transformer classes that can be manufactured locally; namely, 0.5 MVA to 2000 MVA. The graph depicts the import and export statistics measured in units (number) of transformers.

Graph 1; Transformer Exports, Imports and Trade Balance (Units)



Source: Quantec, SARS Customs

Most notable, is the sharp increase in the number of units imported between the years 2003 to 2007. Over this period, the cumulative total of transformer imports increased by a significant 1804% from 63 965 units imported between 1998 and 2002 to 1 218 036 imported between 2003 and 2007. Although the imports of transformers have decreased by 64% when the period 2011 to 2015 is compared with the 2003 to 2007 period, the number of imported units recorded a total of 436 670 units, which is considered as being still very high relative to local production capacity.

Table 3 Transformer Imports (units)

Imports	**1998 to 2002**	**2003 to 2007**	**2011 to 2015**
Imported Units	63 965	1 218 036	436 670
% Movement		1804.2%	-64.1%
Average Units p/a	12 793	243 607	87 334
Domestic Capacity p/a	38 024	38 024	38 024

Source: Quantec, SARS Customs (2016), SEIFSA

The concerning aspect of the import trend is the fact that it indicates a lost opportunity for the domestic industry, particularly given the 25 year life span of certain transformers. The

importation of the transformers has also constrained the growth potential of the local industry, and its ability to take advantage of the export market.

Over the period under review, the export performance of the local industry was modest and notably on a significantly lower base, as opposed to the imported units. Exported units of transformers increased 54.3% when the cumulative total of the period 2003 to 2007 is compared to that of 1998 to 2002. Transformer exports subsequently decreased 44.3% when the period 2011 to 2015 is compared to the 2003 to 2007 period.

Table 4; Transformer Exports

Exports	**1998 to 2002**	**2003 to 2007**	**2011 to 2015**
Units	149 472	230 632	128 480
% Movement		54.3%	-44.3%
Average Units p/a	29 894	46 126	25 696

Source: Quantec, SARS Customs (2016)

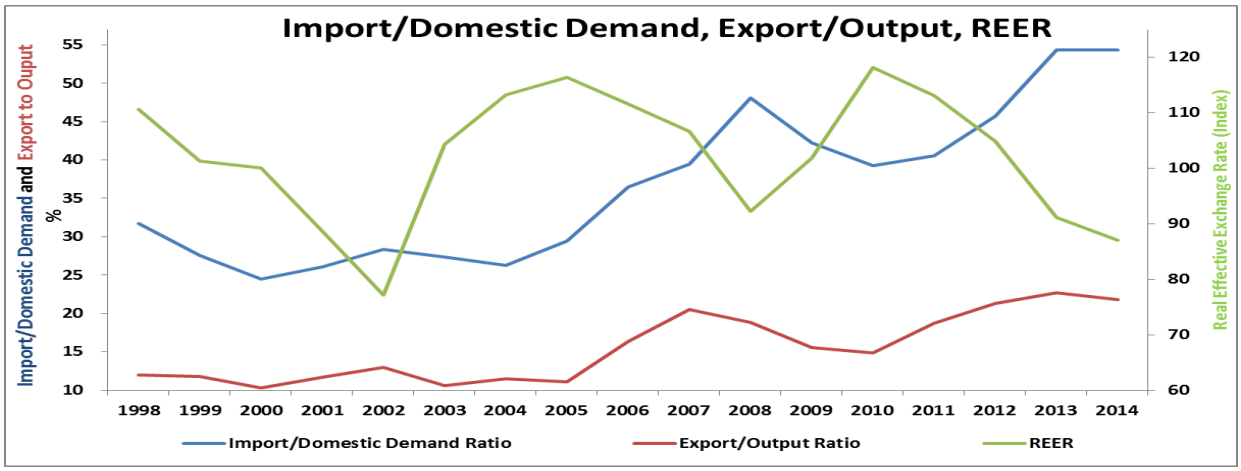
An important aspect to note is the quantum difference between the imported and exported units, measured by the trade deficit. The consumption of imported transformers represents the domestic demand potential of the local economy for transformers. The trade deficit therefore quantifies the opportunity lost to the local manufactures and the extent to which the local industry could have expanded in satisfying this demand. It depicts the extent to which the local industry has lost local market share to international competitors.

In 2015, 46% of transformer demand was satisfied by local manufacturers, while 54% of the demand was satisfied by imported transformers. This is in stark contrast to the scenario in 1998 in which 70 % of the domestic market demand was satisfied by local producers, and imported transformers satisfied the balance of 30%.

Graph 2, on the left-axis depicts the import to domestic demand ratio, that is, the domestic demand of transformers satisfied by imported transformers. An increase in this ratio indicates a greater degree of imported transformers satisfying local demand, while a decrease in the ratio would entail a greater degree of domestically manufactured transformers satisfying local demand.

The trend has significantly deteriorated between 1998 and 2015; however, a rapid deterioration in the trend can be identified between the period 2003 and 2007. This is consistent with the earlier observation, of a significant increase in imported units of transformers over this period. Post the global recession of 2008/2009, the trend has continued to deteriorate, albeit on a notably higher level, exceeding 50% in 2013.

Graph 2; Import/Demand Ratio and Export/Output Ratio



Source: Quantec, SARS Customs

In graph 2, and also on the left-axis, depicts the export to output ratio, which measures the share of locally manufactured transformers that are exported, relative to total output. An increase in the ratio depicts a greater degree of export capability, and a greater degree to which local manufacturers are able to take advantage of the export market.

Exported transformers relative to total output recorded a lacklustre trend ranging between 10% and 20% for the period 1998 to 2015. The maximum achieved in a single year over this period has been 22.75% in 2013. In 2015, exported transformers relative to total output made up 21.77%.

Graph 2, overlays the import and export ratios over the real effective exchange rate (REER), measured on the right-axis. The REER is recorded as an index; therefore, a numerical increase in the index is indicative of Rand strength, with the opposite applying for a decrease in the index. Periods of significant Rand weakness has not translated nor contributed to the export performance of the transformer industry. Evidence of this fact is particularly clear over the period 2010 to 2015, where the Rand weakened 25% on a real

effective exchange rate basis; however, the ratio of exports relative to total output has trended sideways, with a slight but insignificant increase.

b) Impact of the Exchange Rate

A contributing factor, amongst others, to the sharp increase in imports and the sideway trending exports observed during the period 2003 to 2007 is the exchange rate.

Over the observed period, 1998 to 2015, there are two periods of significant Rand strength namely 2003 to 2007, being the longest single period of sustained Rand strength and a short peak observed in 2010. The former can be associated with strong economic growth during this period, a function of the Growth, Employment and Redistribution (GEAR) economic policy, a macroeconomic policy framework focused on prudent fiscal discipline and economic growth, which created investment confidence and attracted capital inflows into South Africa and therefore a relatively stronger currency. However, this is not to say that the improved growth was unique to South Africa, the period was generally characterised by strong economic growth globally. The latter, peak of 2010, can possibly by associated with an increase in economic activity related to the Soccer World cup, hosted by South Africa in that year.

During the 2003 to 2007 period, on a real effective exchange rate basis the rand was 15% and 12% stronger than its 1998 to 2002 and 2011 to 2015 levels, respectively. By implication, imported product would have been cheaper and exports less competitive during this period.

Using an ordinary least squares (OLS) regression model in testing the impact of the exchange rate on imports and exports of transformers, confirms the impact of the exchange rate on the import and export statistics.

An interesting observation is that a statistical significant relationship can only be confirmed for the impact of the exchange rate has on the propensity to import transformers, while no relationship can be confirmed for the exports of transformers.

Table 5; Regression result – Log of Exchange rate and Log of Imports

Inpendent = Log of Real Effective Exchange Rate				
Dependent = Log of Imports				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LREER	**8.34**	**2.51**	**3.32**	**0.00**
C	-27.48	11.61	-2.37	0.03
R-squared	0.4075			
Prob(F-statistic)	0.0044			

Source: Researchers Analysis, Eviews

Table 5, above confirms that a 1% strengthening of the real effective exchange rate of the rand, results in an 8.34% increase in the imports of transformers. The regression results for the impact of the exchange rate on the exports of transformers returned statistically insignificant results, contained in table 6 below, therefore confirming that lack of a relationship.

Table 6; Regression result – Log of Exchange rate and Log of Exports

Inpendent = Log of Real Effective Exchange Rate				
Dependent = Log of Exports				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LREER	**-0.20**	**3.03**	**-0.07**	**0.95**
C	10.76	13.98	0.77	0.45
R-squared	0.00			
Prob(F-statistic)	0.95			

Source: Researchers Analysis, Eviews

The regression results reported above are in line with the findings by (SEIFSA, 2016), in which it is identified that the exports of the South African engineering sector, which includes the transformer industry, are not sensitive to the exchange rate due to domestic rigidities. Imports are however very sensitive to the exchange rate, even increasing in times of significant rand weakness, due to the greater reliance of the sector on imported product, as domestic productive capability is eroded.

This has important implications in informing industrial policy as it suggests that the solution to expanding the industrial capability and capacity of the transformer industry, cannot solely be centred on the notion of a weak currency being the panacea to achieving this end. While

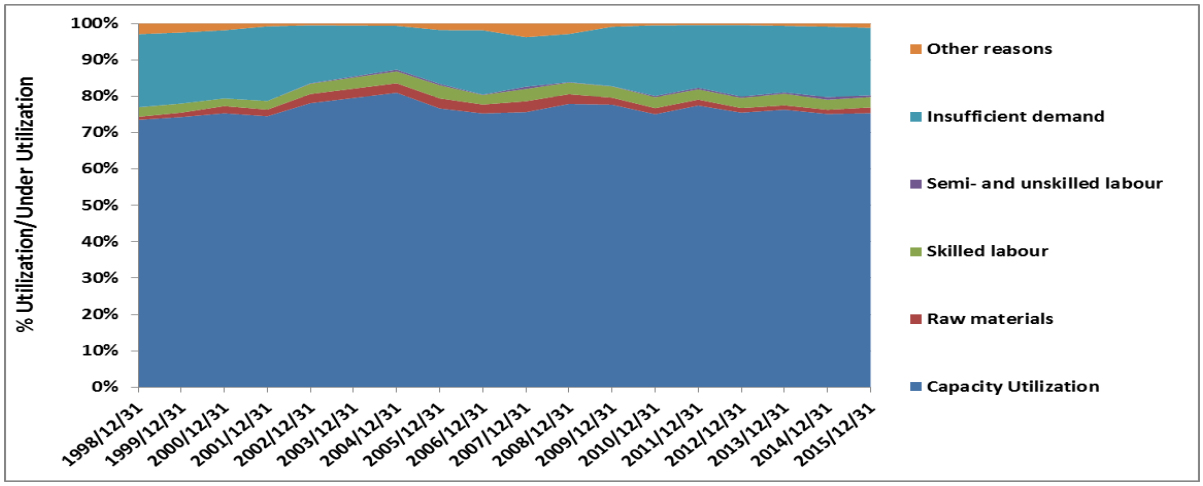
a weaker exchange rate will contribute, a certain degree, to the competitiveness of transformer exports, it should only be considered as being part of a broader basket of industrial policy tools. In this basket, less focus should be placed on its contribution, particularly given the fact that industrial policy cannot influence the direction of the currency.

c) Capacity Utilisation

Capacity utilization of an industry is important for a number of reasons; firstly, it indicates the extent to which an industry is operating relative to its potential, therefore indicating the opportunity cost of any unused capacity. Secondly, the difference between the potential output and the actual output, gives insight into the degree to which an industry can take additional orders immediately, without needing to expand existing operations. Capacity utilization as a metric is also important in determining where on the cost curve an industry will operate, that is; higher capacity utilization reduces the total unit cost, therefore favourably influencing the industries competitiveness, both locally and on the export market. The converse holds true for lower capacity utilization.

Over the period 1998 to 2015, the capacity utilization has averaged 76% for the transformer industry. While 100% capacity utilization would be the most optimal and desired level to operate at, 85% capacity utilization is theoretically considered to be a sustainable level to operate. Even on the relaxed conditions, the transformer industry has operated significantly below sustainable levels. By implication, the lower capacity utilization levels have adversely impacted the transformer industry, through increasing total unit costs and therefore negatively influencing the industry's competitive capability both locally and in export markets. This is also confirmed by the lacklustre export performance identified earlier.

Graph 3; Capacity Utilization and Under- Utilization – Transformer Industry



Source: Quantec, Statistics South Africa

Equally as important as measuring the capacity utilization metric is identifying the reasons under-pinning the under-utilization of the industry. In table 7 below, insufficient demand is identified as the greatest contributor to the capacity under-utilization of the transformer industry, constituting 73% of the reasons for under-utilization between 1998 and 2015. The lack of skilled labour contributes 13% to the reasons for under-utilization. The skilled labour constraint is one that is endemic in most industries in South Africa, particularly those requiring strong maths and science capabilities. The skills constraint represents an entire structural dynamic of the South African socio- economic paradigm, but one that is beyond the research objectives of this thesis.

Over the observed period 1998 to 2015, raw material scarcity made up 8% of the reasons for the under-utilization in the transformer industry.

Table 7; Reasons for Capacity Under-Utilization – Transformer Industry

		REASONS FOR UNDER-UTILIZATION					
Period	Capacity Utilization	Raw materials	Skilled labour	Semi- and unskilled labour	Insufficient demand	Other reasons	Total (Sum)
	Percentage %						
Average (1998 to 2015)	76	2	3	0	17	1	100
Average (1998 to 2002)	75	2	2	0	19	2	100
Average (2003 to 2007)	78	3	3	0	14	2	100
Average (2010 to 2015)	76	1	3	0	19	1	100

Source: Quantec, Statistics South Africa

The results reported above have an important implication for industrial policy, in that they isolate the lack of demand as the most significant reason for capacity under-utilization in the transformer industry. An industrial policy solution dealing with this aspect would make significant strides in building the industrial capacity of the industry.

d) Input Costs

An analysis into the nature of the input cost basket and the performance of the input costs that domestic transformer manufacturers have to contend with reveals significant detail about the constrained position in which the local industry find themselves.

Table 8 below, presents the input cost basket associated with transformer manufacturing. The table lists the cost components, the associated weight contribution of each cost component; relative to 100%, and lastly the table lists the method by which each cost component is determined.

52% of the costs associated to transformer manufacturing are exchange rate linked, therefore rendering the management of these costs outside of the manufacturers control. Turbulent currency volatility in the Rand as experienced over the last few years makes the operating environment challenging and very costly; firstly, the additional costs associated with mitigating currency risk, but secondly and more important is the cost of making an incorrect call on the currency movement, and the disastrous impact associated with it.

Table 8; Input Cost Basket – Transformer Manufacturing

Input Cost Basket		%	%	Determination
Total		**100**		
Labour		34.8		**Domestic (Bargaining Council)**
Raw Materials		72		
	Electrical Steel (Grain Oriented)		27.6	**Exchange Rate**
	Copper		14	**Exchange Rate and London Metals Exchange**
	Transfomer Oil		7.7	**Exchange Rate and Oil Price**
	Transfomer Insulation		7.6	**Domestic**
	Mild Steel		5.7	**Domestic**
	Aluminium		2.6	**Exchange Rate and London Metals Exchange**

Source: Researchers Analysis

Sourcing raw materials domestically has continued to prove difficult for the transformer manufacturing industry and hence the quantum of exchange rate linked costs in the

transformer manufacturing input cost basket has been on a steady increase over the last few years.

Domestic raw material producers of aluminium and copper have struggled to maintain sustainable operations in South Africa. The production of both copper and aluminium is very electricity intensive, making up 16% to 20% of total input costs (SEIFSA, 2016), and therefore sustainable operations require the availability of cheap and abundant energy. In South Africa, since 2008 the availability of electricity has been limited while the cost has increased significantly, therefore placing the sustainability of these operations in question. Prime examples supporting this fact include are the closure of the Bayside Aluminium Smelters owned by BHP Billiton in 2014. In its 2014 financial statement the company sited financial pressures from electricity, labour costs and instability as being the reasons informing the closure of the plant. Similarly, Phalaborwa Mining Company which mines, produces and supplies copper domestically has suffered severe financial pressure from labour instability over the recent number of years which has resulted in short supply of copper to the South African market (Soverall, 2012). The establishment and running of these aluminium and copper operations is also very capital intensive and therefore a greater degree regulatory and demand certainty, both of which have been lacking in South Africa, is necessary in order to attract investment into the industry.

These are just two examples of challenges that are endemic in the raw material market, which in turn have an adverse impact on the transformer manufacturers. The implications for the transformer industry entail greater reliance on imported raw material and therefore greater exchange rate exposure. These dynamics also have implications for local content regulations and the inability of the local industry to adhere to them, by no fault of their own. This has to be a key consideration in designating the transformer industry.

The section above has dealt with the structure of the input cost basket involved in transformer manufacturing. Another important aspect for consideration is the inflationary increases related to the input cost structure. Analysing the performance of the input costs between 2010 and 2015 reveals the following aspects;

Due to the nature of the costs involved in local transformer manufacturing and their association with the exchange rate, the industry has had to contend with cost increases,

significantly above inflation. The absolute percentage increase column depicted in table 9 below, present the inflationary increase associated with each input cost item between 2010 and 2015. Over this period, the absolute cost increases, recorded from highest to lowest, are transformer insulation = 43.25%, labour = 41.80%, electrical steel = 33.8%, Aluminium = 30.18%, copper = 28.10%, transformer oil = 22.10% and mild steel 12.40%.

The weighted percentage increase adjusts the absolute percentage increases by their percentage contribution to the input cost basket, therefore allowing the measurement of the inflationary increase for the input cost basket in its entirety. The total weighted inflationary pressure experienced by transformer industry between 2010 and 2015 is 34.29%.

Table 10 – Input Cost Increases – Transformer Manufacturing

		2010 to 2015	
Input Cost Basket	**% Contribution**	**Absolute % Increase**	**Weighted % Increase**
Labour	**34.8**	41.80%	14.55%
Raw Materials			
Electrical Steel (Grain Oriented)	**27.6**	33.80%	9.33%
Mild Steel	**5.7**	12.40%	0.71%
Copper	**14**	28.10%	3.93%
Transfomer Oil	**7.7**	22.10%	1.70%
Transfomer Insulation	**7.6**	43.25%	3.29%
Aluminium	**2.6**	30.18%	0.78%
Total	**100**		34.29%

Source: SEIFSA, ETSA, Researchers Analysis

The significance of the above mentioned input cost inflation is understood, when it is compared against the output price inflation, that is, the cost increases the transformer industry was able to pass on into the market.

Inflation in the selling prices of transformers, measured by the Output Price Index, increased 11.2% between 2010 and 2015[6].

Due to competition in the transformer market, the scenario suggested above, is one wherein the local producers are unable to pass on the cost increases that they experience into the market. The difference between the input cost inflation and the output price is

[6] Quantec 2016

23.09% over the period 2010 to 2015. The consequence is significant profit margin erosion, on the part of domestic producers.

The inflationary cost increases and shrinking profit margins should be considered in light of the capacity utilization statistics presented earlier. As identified, capacity utilization determines the position on the cost curve in which a company will operate, wherein, lower capacity utilization levels contribute toward a higher total unit cost. The cost increases identified above are over and above the cost pressure associated with utilization levels, therefore further threatening the sustainability of the transformer industry.

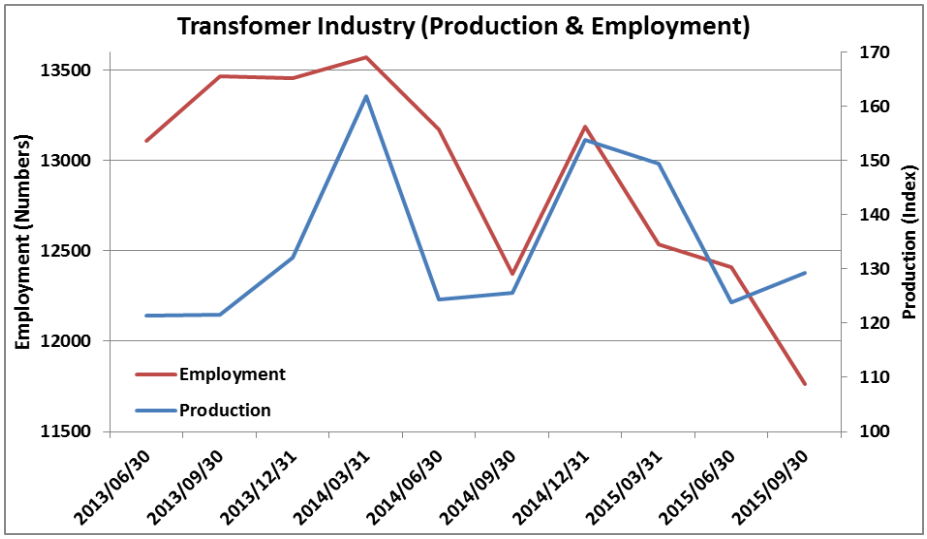
e) Production trends and employment

In the last few years the transformer industry has experienced wild fluctuation in the production trends. The volatility in the production trends not only makes any planning very difficult, but also costly in terms of demand and resource management. The long lead times associated with transformer manufacturing make 'just in time' manufacturing impossible and the bulky nature of some transformer sizes make it costly to hold stock on hand. Additionally, there are strict quality requirements stipulated for the length of time a transformer can sit in storage before installation into a grid. Failure to adhere to these requirements can threaten the very integrity of a power grid.

Careful balancing of these dynamics is therefore essential to the sustainability of the industry, however, fluctuating demand and in turn production trends make the exercise virtually impossible.

Graph 4 below, overlays production trend on the employment levels in the transformer industry. Employment figures are measured on the left-axis and the production index is measured on the right-axis.

Graph 4; Employment and Production – Transformer Industry



Source: Quantec, Statistics South Africa

A steady decline in the employment levels is evident in the graph, a result which partly can be attributable to the production instability. Employment costs present an aspect of the input cost basket that manufacturers have a relative degree of control over. As operating costs increase, owing to a lack of demand, the natural first response for any producers would be cost management, beginning with those costs the producer has influence over. Between the first quarter of 2013 and the third quarter of 2015, the decrease in employment levels for the transformer industry equates to a 13.3% decrease or 1808 direct jobs.

This also has important implications for consideration into the formation of industrial policy, as it would need to be structured to ensure a smooth demand profile, in order to ensure a easier planning and a more stable operating environment.

f) Overview of the Transformer Industry

Over the period under review, 1998 to 2015, the analysis above has confirmed a general deterioration in the operating environment of the transformer industry. The following table

confirms this trend by analysing the survey responses[7] by purchasing managers in the transformer industry[8].

In a manufacturing operation, purchasing managers contribute a vital role as they have to manage aspects such as demand relative to stock levels, production, the raw materials and resources required, to name a few. They therefore have a bird's eye view over a particular industry and hence this survey is directed at them. The importance of the analysis below is in providing an overall snapshot into the operating performance of the transformer industry.

As has been identified earlier, the 2003 to 2007 period presents a structural shift in the majority of the trends analysed, therefore, the analysis contained in the table 11 below compares the two periods namely 1998 to 2002 and 2011 to 2015, in deriving an outcome of whether the operating environment has improved or deteriorated.

Table 11; Overall Operating Environment – transformer Industry

Catergory	1998 to 2002	2003 to 2007	2011 to 2015	Improvement/Deterioration
Domestic sales volumes (Net balance)	-8	26	-2	
Export sales volumes (Net balance)	19	-14	15	
Production volumes (Net balance)	13	29	2	
Domestic order volumes received (Net balance)	-6	25	-2	
Export order volumes received (Net balance)	15	-12	11	
Unfilled orders in relation to sales (Net balance)	-9	10	-18	
General business conditions (Net balance)	-17	-1	-36	
Number of factory workers (Net balance)	-24	1	-29	
Average hours worked per factory worker (Net balance)	-16	12	-14	
Manufacturing - Electrical Machinery: Fixed investment (Net balance)	-7	27	14	
Rate of increase in average total cost per unit of production (Net balance)	47	41	61	
Rate of increase in average labour cost per unit of production (Net balance)	52	46	62	
Rate of increase in average purchase price per unit of raw material (Net balance)	69	53	49	
Rate of increase in average domestic selling price per unit of production (Net balance)	21	39	37	
Rate of increase in average export selling price per unit of production (Net balance)	21	-27	34	
Current stocks of raw materials in relation to planned production (Net balance)	31	23	25	
Current stocks of finished goods in relation to expected demand (Net balance)	35	20	35	
Percentage gross rating present level of output below capacity (Percentage)	80	60	85	
Weighted percentage rating shortage of skilled labour a constraint (Percentage)	50	57	56	
Percentage rating shortage of semi-skilled labour a constraint (Percentage)	20	28	26	
Percentage rating shortage of unskilled labour a constraint (Percentage)	2	9	4	
Percentage rating shortage of raw materials a constraint (Percentage)	25	39	33	
Percentage rating short-term interest rates a constraint (Percentage)	49	27	32	
Percentage rating insufficient demand a constraint (Percentage)	71	65	73	
Percentage rating general political climate a constraint (Percentage)	62	34	68	
Expected volume of goods imported in 12 months' time (Net balance)	47	57	40	
Expected volume of goods exported in 12 months' time (Net balance)	40	21	30	
Expected real investment in machinery & equipment in 12 months' time (Net balance)	-16	12	-4	
Expected business conditions in 12 months' time (Net balance)	-2	18	-30	
Net Score				33 % Improved/67% Deteriorated

Source: Bureau for Economic Research, Quantec

[7] Quarterly Survey Compiled by the Bureau of Economic Research (BER) and accessed through Quantec
[8] The survey also includes purchasing managers of the Electric Motor Industry. The Electric Motor Industry has a very similar profile and products to the Transformer Industry

On the aggregate the analysis identifies that there has been 67% deterioration in the operating environment of the transformer industry, while 33% of the variables considered have improved. An observation derived from the analysis is that majority of the variables that have deteriorated are generally those that are influenced by demand factors, that is, domestic sales volumes, export orders received and export volumes, stock of raw materials in relation to stock levels. The variables that have generally improved are related to internal efficiencies, which would naturally be incumbent on the producers to initiate themselves, namely; fixed investment, and those variables to which the companies cannot influence, namely; short term interest rate as a constraint.

Another interesting observation is the deterioration in macro, cross cutting variables, that is; general business conditions, expected business conditions in 12 months, politics as a constraint, and insufficient demand as a constraint.

In summary, it is evident from the analysis above that the transformer industry is under immense pressure in the local market and by implication, on the export market as well.

Locally, domestic manufacturers have suffered from lower volumes, owing to Eskom and the municipalities opting to import fully manufactured transformer units.

In Sub-Saharan Africa, South Africa is one of the few countries with any local transformer manufacturing capacity, therefore offering the opportunity for the local industry to explore regional exports; however, local manufacturers are increasingly finding it difficult to compete, on price, with their international counterparts (Soverall, 2012).

Competition on the African continent, that is; the companies that South African companies compete with for contracts on the continent, is an uncontrollable variable in terms of domestic industrial policy. Similarly, the awarding of the contracts also falls outside of the ambit of industrial policy. Apart from considering the most competitive price, governments and companies on the African continent are not under any strict obligation to award contracts to South African companies.

Conversely, on contracts issued for South African transformers to be utilized in the local power grid, the conditions applied when considering the awarding of contracts is a variable falling within the sphere of influence of industrial policy.

The fundamental objective becomes controlling that which industrial policy can control, in order to favourably influence that which it cannot. This has been one of the main points advanced by the local transformer industry, in advocating for the designation of transformers. Designating transformers would increase the volumes manufactured by local producers, which in turn would increase their capacity utilisation therefore favourably influencing their total factor cost and ultimately enhancing their ability to be price competitive against their international competition on the African continent and globally.

The industry's ability to take advantage of the export market will be a derived benefit, one derived from resolving the domestic challenges.

8) **Research Findings**

The sections preceding the current one have sought to separately research and establish the dynamics underpinning designation; the policy instrument and those underpinning the transformer industry; the target industry for industrial policy. This section brings the two aspects together in presenting the research findings;

a) Transformer Industry and Designation Specific Findings;

The transformer industry analysis covered in section 7, broadly identified a sector that is under severe strain, with the reasons including; unstable production, input cost increases much greater than the industry's ability to increase selling prices; therefore suggesting diminishing margins, low capacity utilization and a steep increase in the imports of transformers.

The analysis identified the importation of transformers as potentially the most significant reason constraining the growth and sustainability of the industry. A lack of demand was also identified as a contributing factor to the distress currently being experienced in the industry, however, a lack of demand for domestically manufactured transformers, is a function of the demand being satisfied by imports. Input cost increases also contribute to this pressure, therefore rendering the local industry uncompetitive and imported transformers claiming more domestic market share, further constraining local demand and the local industry.

The research findings are categorised by role player, namely; 1) the industry, 2) the client (s) – Eskom and the Municipalities, and 3) the DTI

i) Industry

Since 2012, the domestic transformer manufacturers have lobbied the DTI for the designation of transformers. The efforts to lobby the DTI were triggered by revelations of the Ethekwini Municipality importing the transformers, after a tender was awarded to a foreign company over all the domestic companies.

The first point to bring to bear is that the initial consideration to designate an industry, is not the sole prerogative of the government, in its developmental state capacity, but can be brought forward by industry, as a form of application, for consideration by the government. This has an important implication, in widening the government's capability and sight; into those industries that may not have been under consideration by the government, but have significant national and strategic importance.

In their lobbying attempts, the transformer industry was requested by the DTI to complete an industrial/sector research review of the transformer industry (step 1 of the designation process), in order to give the DTI greater understanding into the sector. This however creates a number of predicaments for the transformer industry, namely;

Firstly, none of the transformer manufacturing companies are listed entities, and as a result they enjoy a relative degree of privacy, that is, only a limited amount of commercial information has to be in the public domain. For these companies, information such as market share, output, types of transformers produced, areas of the business where they are experiencing growth, export markets, to name a few, is information they deem as giving them a competitive edge. As a result, it is information they would rather prefer to keep confidential, particularly from their competitors. However, this information is necessary for the DTI's consideration for designating an industry.

Secondly, this also suggests a policy contradiction with the competition regulation of the country. In order to avoid companies engaging in anti-competitive behaviour, the competition regulations prescribe strict regulation about the kind of information companies can and cannot exchange. The predicament created is that, relaxing the competition

regulation in order to make way for this step of the designation process would open the temptation to anti-competitive behaviour, particularly, if the designation is approved and demand is increased to a finite group of domestic suppliers. However, in order for the DTI to make a well informed decision, it would need all the information possible.

Recommendation

Sector/Industry Overview; In order to improve the designation policy instrument, it would be well advised for the DTI to take on all sectoral analysis through the research capacity that exists within the DTI. In compiling the research, the researchers would then liaise with the respective companies, industry experts and call discussion workshops, in order to understand the industry. This would place full control in the hands of the DTI and eliminate the constraints created by the competition regulations.

Further, there is a conflict of interest for the industry if they are requested to put forward a case for designation, while also being the beneficiaries of the designation. By the DTI compiling the information and conducting the research any potential manipulation of data is eliminated.

ii) The Client: Eskom and the Municipalities

The clients; Eskom and the Municipalities (referred to collectively as 'the clients', unless stated separately), are both client and culprit, to where a great deal of responsibility can be apportioned, in terms of the position the transformer industry finds itself. However, the blame cannot entirely be placed on the clients. The challenges that they themselves experience are a function of policy faults at a macro level, which in turn translate to challenges for the transformer industry.

Reference is made to the clients as both client and culprit, because Eskom holds the transmission and distribution licences and therefore is responsible for maintaining and expanding the power grid. Similarly, the 177 municipalities that buy electricity in bulk and distribute it to the end consumers co-own their respective portions of the grid with Eskom. This suggests that the decision to either buy locally manufactured transformers or to import them is incumbent on the clients.

Eskom finds itself in a precarious position because it is a state owned entity, which has deliverables set for it by the state. Amongst others, the deliverables include enterprise/supplier development, competitive enhancement of suppliers and to play a role in transforming their supply chan. Eskom also falls under the ambit of industrial policy, where it can be used as a policy tool, if and when a strategic need arises. However, the utility has a very constrained balance sheet, the result of historic self-afflicted and policy influences; which resulted in the utility not building any electricity capacity, nor maintaining the power grid. Correspondingly, there has been a shock realization of the need to expand and maintain the power grid, which has resulted in investment decisions made in a hasty manner.

As a result, Eskom has raised its reservations about designation, primarily citing financial reasons. The utility has argued that given the urgency in the need to resolve the country's power crises, it would be in the country's best interest if the utility was granted the permission to pull all available resources, even if it means importing transformers. They also argue that if adequate and well executed currency hedging plans are in place, it would be cheaper to source transformers from global OEM's who have global scale and therefore are price competitive.

Another financial argument extended by the clients is a concern that designation of transformers would result in a price premium being paid by the clients. The rationale is that designation would create complacency on the part of the local industry, who in turn would not be motivated to innovate, therefore passing on price premiums because of inefficiency. Competition from international companies keeps the domestic industry continually innovating.

In order to eliminate the possibility of price premiums, one of the methodologies stipulated by the DTI is the use of international price benchmarking. Through this method, the prices of imported product are compared with local prices. The challenge with this system as applied by the DTI is that it does not take into account the difference in the inherent cost structure between the two countries whose prices are being compared. As identified in the sector analysis in section 7, the transformer industry is plagued by a structurally high input cost base, a function of domestic rigidities and an increasing reliance on imported product. This

in turn increases the exchange rate exposure in the cost base and reduces a company's ability to control costs. Additionally, government subsidies in the form of cheaper input costs in trading partner countries, such as; India, China and South Korea, artificially lower the selling prices. This suggests that domestic companies are not competing with market prices, but artificially managed selling prices.

A different but peculiar argument raised against designation by Eskom is with regard to some World Bank Funding it received in 2010. The conditionality, amongst others, of the loan received from the World Bank, is that recipients of World Bank project funding cannot exclude countries from bidding for contracts related to the funds dispersed by the World Bank. Eskom has argued that designation would entail contravening this aspect of the loan agreement. Additionally, given the constrained balance sheet of the utility, it would be prudent to keep all its potential funding options open. Designation would therefore limit its ability to deliver on its actual core mandate which is to ensure adequate electrification and distribution of the electricity. This is an important aspect the consideration for designation would have to take into account, because without adequate funding, irrespective of the source, the utility cannot ensure the sustainability of the entire grid. At the present moment; the challenge is compounded by the funding constraint faced by the utility.

The clients have also cited the fact that the local industry does not have the necessary production capacity to meet demand, and that this would result in delays on orders placed. This point is true when the following table is considered. The table analyses the annual average production, import and export trends between 2011 and 2015 in order to establish the deficit in production capacity of the local industry.

Table 12; Transformer Industry Production, Import and Export

2011 to 2015	Transformers (Units)
Produced	28 514
Exported	25 696
Sold Locally	2 818
Imported	87 334
Sold Local + Imported = True Demand	90 152
Domestic Production Capacity (Full)	38 024
Deficit	**52 128**

Source: SEIFSA, Researcher Analysis

The table confirms the client's contention that the local industry does not have the sufficient production capacity in order to meet demand. The analysis above confirms an approximate deficit of 52 128 transformers units per annum. This deficit assumes the industry working at full capacity.

However, it has to be considered that the transformer manufacturers are not operating at full capacity. In the sector analysis (section 7), it was identified that the capacity utilization for the sector has averaged 76% over the 17 year period between 1998 and 2015. This is below the relaxed capacity utilization conditions that assume 85% to be full capacity. Therefore, investing in additional capacity, when the current capacity is not fully utilized would not make business sense for the local industry. In a scenario of increased capacity utilization, the industry would naturally be induced to invest into additional capacity. This suggests that the challenge resides with subdued demand in the local industry, which in turn is a function of a higher propensity to import by the clients.

This does have important implications for industrial policy, in that if capacity utilization was increased overnight through designation, considerable lead time would need to be allowed, for the domestic industry to set up additional physical infrastructure as they expand their capacity. Designating the sector should therefore be introduced with an import quota, one that allows the domestic industry to operate at full capacity as they build up additional capacity, without infringing on the ability of the clients to carry out their respective mandates.

Recommendation

Price benchmarking; the DTI should consider the inclusion of the input cost structure of the respective country's when conducting a price benchmarking exercise. This will ensure a more accurate reflection of the selling price of an imported product relative to the domestic product.

Gradual Capacity Building; the consideration to designate the transformer industry needs to take into account that the domestic capacity of local manufactures is below the true demand of the clients. As the domestic industry builds capacity, it would be worthwhile to introduce designation with an import quota on imported transformer. The quota would be

one that allows for domestic capacity utilization to be filled without infringing on the clients ability to deliver on their respective mandates.

iii) Department of Trade and Industry (DTI)

The research findings related to the DTI are predominantly in line with process and areas for consideration about the designation process.

Chiefly, an important step not included in the designation flow chart, but one that is adhered to in practice, is that, following the 'Approval by the DTI's designation Advisory Committee' (after step 3), this decision is referred to National Treasury. National Treasury, in turn conclude an assessment of the industry and audit the decision taken by the DTI's Designation Advisory Committee. While this is an important step, it does induce unintended consequences, namely; it increases the lead time for an outcome on a designation application. Additionally, because it is not included in the process flow chart, and if not communicated well enough to the industry it creates a great deal of uncertainty.

It should be considered that if the intended outcome of designation is increased demand, increased demand requires increased investment by the domestic companies in order to meet this additional demand. The process of securing additional investment, from banks or raising equity is a process itself, and one that needs to be underpinned by absolute certainty, on the part of the companies and potential funding partners. Long lead times induce a great deal of uncertainty for the local industry, and in the age of rapidly mobile capital, uncertainty can present a lost opportunity as capital finds alternative uses.

The point above also addresses a broader challenge of communication, between state and industry and within the state itself. The uncertainty discussed above can be eliminated if there is frequent communication between both state and industry. The objective should be to institutionalise the communication, therefore ensuring that the communication is not solely based on the rapport between two individuals within the respective constituencies. This would also resolve the challenge of communication within the state itself, which has a bearing on the message communicated to industry. One of the contentions raised by industry, is that, the uncertainty is often exacerbated by the different responses received

from state officials when requests are put to them about the reasons for the long lead times, or where the in the process the request is. Having a structured communication platform between both sides would ensure elimination of any uncertainty.

Recommendation;

Designation flow Chart; ensure that all steps involved in the designation process are included and communicated adequately. Additionally, each step should be accompanied by the approximate timeframes involved in order to ensure certainty on the part of industry.

Institutionalise communication; between state and industry, this will further enhance the certainty and ensure a clear and consistent message is communicated.

9) Envisaged Industrialization Path (Model)

This thesis has advocated for the use of designation as an industrial policy tool, in order to broaden the industrial base of the transformer industry. This section seeks to propose a working model containing specifics on how this can be achieved, taking all the learnings from the research into account.

Broadly, the research has identified the lack of domestic demand as one of the root causes for the challenging position the transformer industry finds itself. It identified that a weak exchange rate has very little (to no) impact on the competitiveness of the transformer industry in the export market, but that it actually only contributes to the inflationary pressures experienced by the industry.

The envisaged model borrows from the unique characteristics associated with manufacturing, particularly, the increasing returns to scale return profile associated with manufacturing. The increasing returns to scale characteristic can conversely be stated as the relationship between increasing capacity utilization and a decrease in total unit cost.

The workings of the model are underpinned by the virtuous cycle identified as existing between increased capacity utilization and increased investment, wherein; increased demand, increases capacity utilization and therefore decreases total unit cost. This allows a manufacture to be price competitive and therefore attain greater market share, which requires additional investment in order to meet the demand of the expanded market share.

Meeting the demand in expanded market share equates to a further increase in capacity utilization, therefore further decreasing total unit cost, more price competitiveness, increased market share and further investment. The cycle is then started again, on an expanded scale.

While the export market is the ideal end point in order access global market share, this model advocates a scenario where the local market is used as a yardstick to measure progress.

Table 13, below was presented earlier in confirming the contention that the local transformer industry does not have the sufficient production capacity to meet the local demand. The table is presented again, in order to illustrate the working of the proposed model. The figures represent the trends between 2011 and 2015; however, the choice in period for establishing a production deficit is flexible.

According to the table, the production deficit of the domestic producers is 52 128 transformers. This also presents the deficit that would be apparent to Eskom and the Municipalities (clients) if supply was completely shifted to the local producers. The solution would not be Pareto optimal, as the local producers would enjoy 100% capacity utilization, while the operations of the clients would be significantly impacted because of the deficit.

Table 13; Transformer Industry Production, Import and Export

2011 to 2015	Transformers (Units)
Produced	28 514
Exported	25 696
Sold Locally	2 818
Imported	87 334
Sold Local + Imported = True Demand	90 152
Domestic Production Capacity (Full)	38 024
Deficit	**52 128**

Source: SEIFSA, Researcher Analysis

In reality however, it has been established, that the domestic industry is operating at 76% capacity utilization, or 28 514 transformer units produced per annum. This represents an under-capacity of 9 510 transformers for the producers.

In designating the industry, an import quota which excludes the 9 510 transformers could be imposed at the beginning, therefore allowing the clients to import only 77 824 transformers. In this way, the industry will be encouraged to invest more and expand their capacity as they would be operating at 100%.

Operating at 100% does not create a celling for additional investment, as their propensity to expand is encouraged by the export market.

The designation should then be removed once the production capacity of the local industry is equal to the size of the market.

As a reciprocal control measure, in order to ensure that the local industry invests in expanding their capacity timeously, a timeframe should accompany the designation, for example 3 to 5 years.

Additionally, linked to this timeframe should be a type of productivity clause. The productivity clause is achieved by reducing the size of quota in successive periods. For example, if the timeframe chosen is 3 years, then at the end of year 1 the quota should decrease by a third, end year 2, it should reduce by two thirds and completely removed at the end of year 3.

Once production capacity is equal to domestic demand, then the industrial policy can be considered as successful.

10) **Conclusion**

This research has analysed sectoral designation as a policy instrument for expanding the industrial base in the transformer industry. It identifies that a lack of local demand for domestically manufactured transformers contributes as a significant cause to the challenges currently experienced by the industry. The current scenario is one wherein; low demand, has resulted in low capacity utilization and an adverse impact on total unit costs therefore constraining the competitive capability of the industry and ultimately a loss of market share both domestically and on the export markets.

Decreasing buying power, on the part of the clients; Eskom and the Municipalities, as a reason for the weak demand for locally manufactured transformers is eliminated. This is

because, Eskom solely holds the licence to transmit and distribute electricity in the country. This includes co-ownership with the municipalities on certain parts of the grid. It therefore implies, that the majority (if not complete) importation of transformers for final use, is by Eskom and the municipalities, as all other constituencies in the country would have very limited incentive to do so. That is to say, in the scenario of a part-privatised power grid, the net of potential importers could be cast to a broader group.

From the perspective of industrial policy, this presents an opportunity, given both Eskom and the municipality's status as state owned and being part of the state, respectively.

The model advocated for in this research has been one that reverses the current scenario, by increasing domestic demand for locally manufactured transformers through designation. This would in turn increase capacity utilization, favourably influence total factor costs, and improve the competitiveness of the local industry, and create a virtuous cycle between capacity utilization and expansion.

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Annexure 1

	Company	Location
1	Actom Power	Johannesburg
2	Actom Distribution	Johannesburg
3	Allied Electronics Corporation (Altron)	Johannesburg
4	Powertech Transformers	Pretoria
5	Electro Inducing Industries (EII)	Johannesburg
6	Revive Electrical Transformers	Johannesburg
7	Hawker Siddeley	Johannesburg
8	Free State Transformers	Bloemfontein
9	TSS Transformers	Vereeniging
10	LH Marthinusen	Johannesburg
11	Megatron Federal	Johannesburg
12	Reliable Transformers	Johannesburg
13	Trans Electron Transformers	Johannesburg
14	Transformer Manufacturers (Pty) Ltd	Johannesburg
15	Transtec	Johannesburg
16	PCB Power Transformers CC	Johannesburg
17	Tecc Oil	Johannesburg

Source: SEIFSA