Local Content Requirements in the South African Renewable Energy Independent Power Producer Procurement Programme- With a Focus on Wind

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Abstract

South Africa has in the past relied heavily on coal for its power generation needs. The introduction of an Integrated Resource Plan for Electricity in South Africa marked the government's intention to diversify the country's power generation technologies. Other than diversifying the power generation technologies, the South African government planned on using this shift to boost the local manufacturing facilities. The local content requirements in the country's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) were meant to achieve this goal. This study investigated whether the wind energy project, established through the REIPPPP, has been able to meet the local content requirements. The study further explored possible ways in which local content can be improved. This was done by investigating how other countries had successfully established sustainable local manufacturing of wind energy components.

Keywords
Wind Energy, Renewable Energy

1. Introduction
According to the World Bank, South Africa has one of the most unequal societies in the world. According to the globally accepted measure of a society's inequality, i.e., the Gini coefficient, South Africa's was 0.63. This number is closer to the upper limit of 1 which denotes the most unequal society. With this in mind, the South African government is under immense pressure to introduce initiatives that will create jobs and boost the economy. Increasing manufacturing is one of the key components of the South African industrial policy, as it is a high job multiplier. Manufacturing, however, has not performed very well over the years. South Africa's manufacturing base declined from the very high levels in the 1980s, when manufacturing contributed 23% of the country's gross domestic product (GDP), to 18% in 1997, and to 11% in 2018. To enable the country to create a significant number of jobs, there is a need to focus on this sector and try to improve it. Some of the biggest capital projects that the country has recently undertaken, were in the power generation sector. The lack of proper planning in this sector, meant that the supply of electricity was lagging far behind the demand and needed a significant transformation for it to get in line with the power needs required for the country's economic growth. Power generation, therefore, became one of the focus areas that the government planned to use to boost local manufacturing in the country.

2. Transformation of South Africa's Power Generation Landscape
Historically South Africa has relied heavily on coal as its primary fuel source. It is estimated that at least 72.1% of South Africa's primary energy source originates from coal. As a result of this abundance of coal, almost all of the country's power stations constructed from the 1920s until the 1980s, were coal fired power stations, except for the Koeberg nuclear power plant and a few other power generating plants. The dawn of democracy in the country brought with it an investment that required a substantial supply of power. The lack of proper planning by the authorities meant that the supply of electricity fell far behind the demand. This led to severe rolling power cuts that were detrimental to the country's economic growth. This emphasised the need to have an appropriate strategic plan for the country's energy needs and supply. The country's overall energy plan is known as the Integrated Energy Plan (IEP), while the Integrated Resource Plan (IRP) is a subset that focuses on the plan for electricity in the country. The country's first

IRP was launched in 2010 and was known as IRP 2010–2030. One of the unique aspects of this strategic electricity plan was the diversification of the power generation technologies. Some of the technologies that were included in this 20-year strategic plan were Fossil fuel, Nuclear energy, Renewable energy Cogeneration and Imports (Eberhard, 2003; Department of Energy, 2011; Montmasson-Clair & Ryan, 2014; Pillay, 2016)

This diversified power generation mix was a move away from the over-reliance on coal that the country was accustomed to. For the first time, the country's strategic electricity plan had a specific capacity allocated to renewable energy. According to the plan, renewable energy should increase to 17,8 GW by 2030. The bulk of this allocation went to wind energy and solar photovoltaics (PV), with each being allocated 8,4 GW. The government's plan to get this power onto the grid relied on a partnership with the private sector, which would finance, build, and run these power stations. The government would sign an off-take agreement to use the power generated from these facilities. To this end, in 2011 the government launched a formal programme that would be used to procure this renewable energy from the private sector. This programme is known as the Renewable Energy Power Producer Procurement Programme (REIPPPP) (Department of Energy, 2011; Department of Energy, 2015).

2.1 The design of the REIPPPP

The REIPPPP was a competitive bidding process that pitted different bidders against each other. This was done in successive bidding rounds. The capacity that bidders were vying for in each round was decided by the minister of energy. This set allocation would be divided amongst the successful bidders. The REIPPPP had a set of requirements against which bidders were evaluated and ranked. The final comparative evaluation was based on price and non-price requirements of the bid, known as economic development (ED). The price accounted for 70% of the evaluation, whilst ED accounted for the balance, i.e., 30% (Department of Energy, 2015; Eberhard, et al., 2014)

2.2 Economic development

Economic development was the area of the programme that the government was planning to use to achieve its goal of increasing local manufacturing and job creation. Whilst economic development was split into seven different criteria, job creation and local content constituted 50% of the total. Table 1 lists all the components of the economic development with their respective allocations (Eberhard & Naude, 2016).

Table 1: Elements of economic development and their weights.

Economic development elements	Weight
Job Creation	25%
Local content	25%
Ownership	15%
Management control	5%
Preferential procurement	10%
Enterprise development	5%
Socio-economic development	15%

2.3 Wind Energy in the REIPPPP

Wind energy, together with solar PV, were awarded the largest generation capacity in the REIPPPP. This was partly because these technologies were far more developed compared to other renewable energy technologies. The other reason is that the government saw wind as a technology that could localise some parts of its supplier chain more easily than the other technologies. The value chain of wind energy is quite well developed, and it is easier to identify components that could be manufactured locally (Department of Energy, 2015).

2.4 Wind Energy Value Chain

The idea of a value chain was introduced by Michael E. Porter in 1985. The basic principle of a value chain is that value is added at each step of the process when producing a final product. A wind turbine used to generate wind energy is no exception to the value chain concept. The wind turbine is a final product that comprises different components where value is added along the way.

The main components of a wind turbine are a rotor, tower and the contents of the nacelle. The blades, which are the main parts of the rotor, were traditionally manufactured in Europe by Original Equipment Manufacturers (OEM). This picture is however, starting to change as some of the production is outsourced to third parties, which are locating their production facilities across the world. Blades can, therefore, be produced locally. This also applies to transformers, which is one of the main components of a nacelle. The other components of the nacelle are, however, still produced by OEM in-house. This means that localising these components could be a challenge. Towers on the other hand, are frequently sourced closer to the location of the wind farm. Rolled steel towers are the common ones in the industry. An alternative to the steel tower is the concrete tower, which is starting to gain importance in the industry (Blanco, 2008; Krohn, et al., 2009; Andersen & Larsen, 2013; Fullenkamp & Holody, 2014). A wind farm has other additional components to the wind turbine, most of which can easily be produced locally.

2.5 Wind Energy Local Content Requirements

Just like other technologies in the REIPPP, the local content requirements of wind energy had a threshold and target figures. The threshold figure was the minimum local content that all bids were required to meet; failing this, resulted in that particular bid being disqualified. The target figure served as the ambitious figure that bidders were encouraged to meet. Unlike the threshold figure, failing to meet the target had no adverse consequence on the bid. Table 2 shows the threshold and target figures for each round of submission that applied to wind energy.

Table 2. Onshore wind local content requirements.

Round	Threshold	Target
BW1	25%	45%
BW2	25%	60%
BW3	40%	65%
BW4	40%	65%

Table 2 shows that both the threshold and target figures for onshore wind energy started relatively low in the first round of submissions. These figures gradually increased, and the rules defining the local content in the REIPPPP also changed as the submission rounds progressed (Eberhard, et al., 2014; Urban-Econ Development Economists, 2015; Eberhard & Naude, 2016).

2.6 Wind Energy Local Content Results in the REIPPPP

The definition of local content in the first round of submission was relatively open compared to the later rounds. These were tighter in the second round to only include costs that were spent on South Africans and South African products until the commercial operating date (COD), but excluded the costs incurred to connect the windfarm to the power grid. Another significant change in the second round of submission, allowed all raw and unworked steel to be considered as local content. The third and fourth rounds of submission also came with their own changes to the local content rules.

The local content of the bids submitted in the REIPPPP changed in every round of submission. This was in line with the increasing requirements and the changing definitions of local. The average local content of 27,4%, achieved in the first round of submission, was just above the minimum threshold. This figure increased significantly in the second round, where the average local content was 48,1%, far exceeding the minimum threshold of 25%. The average local content for the third round of submission dropped slightly to a local content of 46,9%. Considering that the minimum threshold for this submission round had been adjusted to 40%, the third round was not as good at the second-round local content. The last round of onshore wind power saw local content drop even further than what was submitted previously. Table 3 shows the results for the local content requirements for onshore wind in the REIPPPP (Eberhard, et al., 2014; Urban-Econ Development Economists, 2015; Eberhard & Naude, 2016)

Table 3. Onshore wind local content results

Round	Average local content
BW1	27.4%
BW2	48.1%
BW3	46.9%
BW4	44.6%

2.7 Impact of Local Content Requirements on the South African Wind Energy Value Chain

As expected, tower production was one part of the value chain that seemed to have benefited from the local content requirements more than any the other components. By the end of the fourth submission rounds, at least two tower manufacturing facilities had been established. These were the DCD Towers and Gestamp Renewable Industries. With the capacity to produce in excess of 370 steel towers with 80% local content and employing a total of 300 people, it is clear that the tower value chain reached the required levels of local content. In addition to the steel tower production, at least one bid proposed the use of concrete towers that could be constructed in the country. For this facility, at least 216 people would be employed. There was no blade or nacelle production facility established throughout the REIPPPP. A number of entities, such as LM Wind Power and DCD, were investigating the feasibility of establishing facilities to manufacture blades and nacelles, respectively (Urban-Econ Development Economists, 2015).

Whilst it is clear that the local content requirements for wind energy led to the establishment of a number of local production facilities, it should be noted that the bidders appeared to aim for the minimum requirements. In the four rounds of submissions, none of the bids achieved nor came close to the targets that the government was hoping to reach. In most rounds, the submissions barely made it past the minimum threshold. Based on this, one can conclude that the local content requirements for wind energy did not achieve what the government was hoping for. Therefore, there is a need to consider alternative ways to try and achieve higher local content figures that will increase local manufacturing. A number of countries around the world have managed to successfully localise wind energy production facilities by deploying a number of initiatives. It is worth exploring how some of these have been considered for the local content issue.

3. International Case Studies

This study compared three countries (China, Spain and Brazil) located on three different continents that have successfully managed to localise a significant part of the wind energy value chain.

3.1 China

One of China's positive characteristics is a well thought out and elaborate industrial policy. This industrial policy is reviewed every five years to ensure that it reflects the prevailing conditions at the time. Electricity planning is an integral part of this industrial policy. Until 2005, China relied heavily on imported wind turbines for their domestic wind energy market. A significant shift was noticed from 2005. By 2007 the country had managed to establish about 40 local production facilities catering for the wind energy market. At the end of 2009, at least three of China's wind turbine manufacturers were counted globally amongst the 10 largest. China's Ride the Wind Program has been instrumental in its localisation success. This programme guaranteed at least 3GW to developers that were willing to form joint ventures (JV) with local Chinese companies to produce wind turbines. The Renewable Energy Law policy mandated the grid operators to buy energy from sources of renewable energy first before buying from others. The 2009 Feed-in-Tariff (FiT) policy also helped give developers the certainty they needed for the tariff before committing to setting up local production facilities. A combination of these policies helped China to be successful in reaching its goal of localising wind energy production, which further supported the authorities' decision to ease local content requirements (Yang, 2011; Wang, et al., 2016; Buckley & Nicholas, 2017).

3.2 Brazil

Brazil also relied on a number of policies instead of just one to drive local content. The Programme of Incentives for Alternative Electricity Sources (PROINFA) was one of the first major policies implemented by the country to try to increase the local production of wind energy components. The main aim of this policy was to increase the renewable energy power generation in the country to 10% in 20 years from the inception of the policy in 2002. The second goal was to ensure that at least 60% of the components were produced locally. Some of the PROINFA's main characteristics included (International Renewable Energy Agency (IRENA), 2012) (Förster & Amazo, 2016) (International Renewable Energy Agency (IRENA), 2015):

- Fixed tariff.
- Guaranteed access to the grid; and
- Guaranteed 30-year power purchase agreements (PPA)

All these measures were meant to give the developers and component manufacturers the assurance needed to establish local production facilities. In 2009 the government decided to do away with PROINFA because of some challenges. It was replaced with a new competitive bidding programme. The main difference between this programme and PROINFA was that it did not explicitly require local content from the wind energy developers. However, for bids to be successful, they needed the very favourable loans that were awarded by the Brazilian Development Bank (BNDES). The rates for these loans were in some cases 50% less than the loans from commercial banks. Other characteristics of these loans were (International Renewable Energy Agency (IRENA), 2012) (Förster & Amazo, 2016) (Weiss, 2016):

- Loans up to 80% of the total investment.
- 16-year payment terms; and
- Basic spread of 0.85% per year.

However, for a bidder to qualify for these loans, they needed to meet a number of strict local content requirements. Some of these were (Förster & Amazo, 2016) (International Renewable Energy Agency (IRENA), 2015):

- Towers had to be produced in Brazil. At least 70% of the steel or concrete had to be sourced locally.
- Blades had to be produced locally.
- Nacelle assembly had to be done in Brazil; and
- The hub had to be assembled locally using locally sourced cast iron.

These policies and instruments played a significant role in the establishment of Brazil's domestic wind energy production market. In 2009 the wind turbine manufacturing market had already created 12,000 jobs. By 2010 the domestic production capacity of wind components stood at 1GW. A number of international wind turbine manufacturers had successfully set up manufacturing facilities in Brazil. These manufacturers include GE, Siemens, Enercon, Sinovel, Suzlon and a few others (International Renewable Energy Agency (IRENA), 2012) (Weiss, 2016).

3.3 Spain

Spain had a different approach to boosting the local production of wind turbine components. Following a number of renewable energy plans, the inception of the National Energy Plan in 1991 saw a number of international manufacturers take notice of the Spanish market. By that time, the government had established an acceptable FiT programme that guaranteed the tariff to the developers of wind energy. The government went further by mandating that renewable energy should receive preference over other sources of energy to be dispatched to the grid. Another important component of the policy was that renewable energy manufacturers were allowed to sell their power to the open market at lucrative prices that were regulated by the government. All of these policies played a large role in attracting foreign manufacturers to the local market. The central government did not specify any local content requirement. However, players in this market quickly learned of the power of Spain's autonomous provinces. Wind energy developers had to get approval from the provinces to locate their wind farms there. The provinces had very strict local content requirements. In some cases, they required local content to be as high as 70%. They stipulated that manufacturers had to partner with local entities for the transfer of knowledge and technology to the local markets. This requirement led to one of the success stories of the Spanish wind market, i.e., the partnership between Vestas and Gamesa. Vestas, one of the largest wind turbine manufacturers in the world, partnered with a local Spanish entity called Gamesa. Vestas held a 40% stake in the JV and also licensed its technology to Gamesa. As a result of this JV, Gamesa was able to grow successfully, to a point where it became one of the largest wind turbine manufacturers in the world. A few times from 2002, it held the number two spot as the largest manufacturer of wind turbines globally (International Renewable Energy Agency (IRENA), 2012) (Ulazia & Arriola, 2018).

A few other success stories of the Spanish wind market are Acciona and the wind farm developer, Iberdrola. In 2010, Acciona had already manufactured 5GW of wind turbines in more than 160 wind countries globally, some in the

United States of America. In 2005 Iberdrola, which built its first wind farm five years prior, was the largest owner of wind power plants across the world. In 2013 Spain was the third largest exporter of wind turbines after Germany and Denmark (International Renewable Energy Agency (IRENA), 2012) (Ulazia & Arriola, 2018).

4. Discussion

The paper has presented how the South African power generation market is being transformed from a coal-based power market to a diversified one, where renewables play a significant role. Of utmost importance, the paper further explored how the government plans to use wind energy to grow local production in the country. Whilst the REIPPPP has resulted in the successful establishment of local production facilities, the level of local production has not gone as far as the government was hoping it would. Wind farm developers have simply met the minimum requirements and based on the local content numbers, there appears to be room for growth in the local production of wind energy components. This study sought to draw some lessons from international markets that had successfully implemented local content policies, which had resulted in the creation of sustainable domestic production of wind energy components. The lessons that can be learnt from the Chinese, Spanish and Brazilian market can be summarised as follows:

- Guarantee large capacity allocation to successful bidders.
- Provide a stable, predictable and sustainable wind energy market.
- Use different policy instruments to drive local manufacturing.

The publication of the IRP2019 was a step in the right direction for the South African government because it shows the continued appetite for wind energy, after a four-year break in the programme. This unexplained break did not instil any confidence in investors and manufacturers. The immediate implementation of the IRP2019 would go a long way in gaining this lost confidence. In addition, the government would require changing the structure of the REIPPPP, to the extent that the allocations for each round are known well in advance to create the predictability required.

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Biographies

Andile Mgudlwa is a seasoned sales and business leader having worked extensively for a number of engineering companies with increasing responsibility. A recent graduate of a Master in Engineering Management degree from the University of Johannesburg, Andile started his career as a chemical engineer. After his exposure to the engineering field, he then ventured into the world of marketing and business development. To help ease the transition to this new field he studied and obtained a degree in Marketing from UNISA. Over the last few years, he has worked for numerous international companies and made a name for himself leading teams that pioneered the renewable energy industry in South Africa. Using his experience gained in the South African business environment, he has successfully led and grown business across the sub-Saharan Africa region. His innovative ideas and leadership style combined with his collaborative approach to problem solving resulted in remarkable success for him and the teams under his leadership. Some of the companies that he has worked for are:
- GE (General Electric) – Senior Sales Leader: Sub-Saharan Africa
- Nordex Energy – Sales Manager: Sub-Saharan Africa
- Siemens – Technical Sales Manager: South-East Africa

Andile joined Tsebo in February 2018 where he is a Sales Director heading up the sales activities for Tsebo Facilities Solutions where he is tasked with growing the business and the footprint of the business in South Africa and beyond.

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He worked at the South African Atomic Energy Corporation (AEC) as a Senior Consulting Engineer for 15 years. He also worked as the Technology Manager at the Satellite Applications Centre (SAC) of the Council for Scientific and Industrial Research (CSIR). He is currently a Professor and Head of School: Postgraduate School of Engineering Management in the Faculty of Engineering and the Built Environment where he has worked since 1998. He has co-authored over 240 research papers and supervised 55 PhDs and over 270 Master's students. He is a registered professional engineer, professional Measurement and Verification (M&V) practitioner, senior member of the Institute of Electrical and Electronic Engineering (IEEE), fellow of the South African Institute of Electrical Engineers (SAIEE) and a fellow of the South African Academy of Engineering.