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PROPERTY DEVELOPMENT RESEARCH REPORT

ELECTRICITY GENERATING REGIONAL AND SUPER REGIONAL RETAIL DEVELOPMENTS WITHIN GAUTENG, IN A SMART-GRID ERA

UNIVERSITY OF THE WITWATERSRAND

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DECLARATION

I, the undersigned, hereby confirm that this research report is my own work and that all sources are adequately acknowledged; this has been done by referencing in-text, and listing the references in the references list.

I would like to confirm that this research report has not been submitted before for any degree or examination at any other University. I certify that the information that I have provided is correct, and I authorize the University of the Witwatersrand to verify the contents and check for plagiarism.

I understand that this information will be used to determine my eligibility for a Masters in Science degree in Property Development & Management, and I pledge to having carried all work out diligently, ethically, and legally.

Karabo Samuel Ramoitheki Pitsoe **Date**

ABSTRACT

South Africa's electricity demand, over exceeds its' supply capability; this in-turn affects a myriad of developmental factors namely: economic growth, business growth prospects, property development, the environment, as well as society as a whole. The traditional (fossil fuel generated) centralized electricity production model, has proven to be insufficient in terms of production capability as well as infrastructure expansion. This has in-turn presented an opportunity for real estate (more specifically listed regional and super-regional retail real estate) to capture a niche gap in the electricity generation market, that of becoming: decentralized renewable electricity generating production plants, that can become self-sufficient and sustainable, while plugging excess electricity back into the national electricity grid; these would in-turn form a network of individual power plants, that can contribute towards the national electricity grid through a smart-grid system, regulated by Nersa and monitored by Eskom.

Structured interviews with industry professionals were captured through audio-recordings; the conversations were then author transcribed through pattern emergence as an interpretation tool, analyzed, and the findings documented in this research report. The major findings illustrated that: there were sufficient incentives from the government that promoted electricity generating real estate; feed-in tariffs were being explored within certain municipalities; within the listed property sector, portfolio greenness was becoming more and more important in commercial property development as well as portfolio sustainability; and technological price-parity had been reached within South Africa (meaning that the justification for utilizing the conventional electricity extractive development strategy, rather than the renewable electricity generating strategy, could no-longer be used as an excuse, due to both methods working out to relatively the same costs overall). Key recommendations where that: the self-sufficiency and electricity generation drive should come mainly from tenants, who could then place pressure on the landlords, who would then begin developing in a generation focused way rather than a cost-saving and low cost method; municipalities needed to look at other revenue generating schemes, as an intervention such as this one would see a possible loss of revenue due to a smart-grid system; and developers needed to begin thinking outside of the box, and creating wealth not only in monetary terms, but also in sustainability terms.

It was concluded that, as much as this intervention could work in the long-run, it would face a few immediate challenges in the short to medium run, namely: grid connection approval, IPP (Independent power producer) approval, the challenges of shopping mall design with a huge dependence on HVAC / mechanical ventilation which uses tremendous amounts of electricity, as well as the electricity consumption of a regional & super regional retail centre almost being on par with the potential electricity that could be produced. With all that having been mentioned, this intervention would be a five to ten year development strategy that could be worked towards, and would create a new benchmark for listed commercial regional & super-regional retail developments within Gauteng.

1 CHAPTER ONE

INTRODUCTION

Throughout South Africa's developmental history, the national electricity parastatal, Eskom, has had a complete monopoly with regards to electricity generation, transmission, as well as distribution; all of which has reinforced the centralized model of electricity generation of the past (Vermeulen, 2015). For the past few years the parastatal has been lagging behind in terms of infrastructure maintenance, as well as infrastructure capacity expansion; allowing for national electricity demand, to over exceed supply capability.

This has cast a dim outlook on electricity preservation for the future: putting into question the growth prospects of the economy, electricity bulk services provision for future property developments, electricity solutions currently being developed to supply current and future electricity demands within South Africa, as well as this research reports' focus: that of listed retail property development electricity sustainability in the future, for developments within Gauteng.

LITERATURE / ACADEMIC SUBSTANTIATION

Godwa and Mamatha (1997) defined infrastructure as catalytic agents that were not directly productive, but were necessary for the development of productive activities. They refined their research findings further by stating that economic infrastructure could be categorized into three broadly defined categories namely: public utilities, public works, and transport sectors; which would describe the current situation South Africa is facing, as a lack of security in one public utility in particular, electricity.

The literature finds that electricity security is essential to the development and growth of an economy; without this, the economy comes to a stand-still, as development (foreign direct investment, and domestic business investment / growth) would then look for greener pastures (Wolde-Rufael, 2009; Luiz, 2010; Sharma, 2010; Govt. RSA, 2014).

The issue then, that would need to be addressed would be, the immediate response to such a crisis and the strategies moving forward to cope with the current energy demand as well as future demands.

Parker (1999) described the centralized energy production model of the past, as a monopoly that secured a sole energy provider or state parastatal: distribution, transmission, as well as energy generation rights; the effect of this led to a limiting of competition within the electricity generation market, as well as levels of energy generation efficiency within the country. Parker went further by suggesting a solution that would consider the partial privatization of public infrastructure, as well as the concept of energy production decentralization. This would allow for the supply and regulation of energy to be monitored by a state parastatal, and leave the energy production / generation to the private sector.

Kaundinya *et al.* (2006) and Varun *et al*. (2009) suggested that an alternative to the conventional energy system - the fossil fuel generated electricity production system - could be one of the solutions necessary in order to cope with increasing energy demands, while supplementing an ailing infrastructure network of a country.

Through the authors' writings, it could be deduced that their aim was not to totally remove renewable energy producing infrastructure from the national electricity grid, but rather to supplement electricity levels by way of either plugging additional electricity into the grid, or by fully or partially privatizing electricity production as part of a countries response to the energy mix.

A solution integrating these ideas from Parker (1999), Kaundinya *et al*. (2006), and Varun *et al*. (2009), needed to be further researched as part of the possible responses within the South African context.

In-light of the current research being undertaken in the property development ambit, a link of all the above mentioned concepts needed to be established in order to incorporate real estate with the ideas of infrastructure development, energy generation decentralization, and renewable energy production; as this was also a vision that was in-line with the vision of the department of energy for the years to come (Govt. RSA, 2014).

Zuoa & Zhaob (2015) found that majority of existing studies in green building were based on previous and current environmental constraints, but did not delve into current infrastructure constraints. The merger of the vast environmental research previously undertaken, as well as the research into infrastructure constraints, would unearth the common linkage of real estate

with the goals of sustainability, as well as renewable energy production; which were sentiments shared by certain authors in the literature i.e. Alanne & Saari (2006), Govt. RSA (2014), and speakers at the 24th AMEU Technical Convention (2014 / 15).

Current real estate developments around the world are introducing components that would contribute towards energy efficiency, building self-sufficiency, as well as electricity generation, i.e. solar / photovoltaic electricity generation technology, tri-generation technology, hydro-powered electricity generation, etc. All of these interventions are aimed at generating energy for the individual property / development, but a gap was left open for integration with the national energy grid in order to mitigate the risk of a lack of electricity security for the nation by decentralizing electricity production (Kaundinya *et al*., 2006; Zuoa & Zhaob, 2015).

These views cited from the body of knowledge, revealed the gap that is currently in the literature pertaining to: the current state of national economic infrastructures, the adaptability of the existing infrastructure to keep up with modern concerns, the transition towards a greener energy production, an integrated energy solution incorporating real estate and property development, real estate acting as a catalyst for future electricity provision, and the path to achieving it.

RESEARCH QUESTION

What are the current circumstances, transitional responses, and possible solutions to achieving energy self-sufficiency in new listed regional & super-regional retail developments within Gauteng?

AIM / PURPOSE OF THE RESEARCH

The purpose of this research report will be: a forward looking and contextualized electricity generation and retail property development intervention within Gauteng, that would be currently implementable by listed retail property developers, and seen as an electricity generation and sustainability benchmark consideration when considering future regional and super-regional retail developments within Gauteng, South Africa. This will see future listed retail real estate developments contributing towards national energy / electricity shortages, real estate electricity generation, and aiding the country to meet the global development goals for a more sustainable energy production and usage.

CONSEQUENSES OF THE PROBLEM

One of the major drivers of property development, is the need for security and provision of bulk-service infrastructure to be in place, for the maximization of the asset to its' full potential. Without such provision / security, development and investment could slow-down dramatically, and see a disinvestment trend introduced into an economy that cannot afford it moving forward. The relationship between infrastructure and economic growth is vital for the research; as stated by John Luiz where he states that, without creating an enabling environment, including superior infrastructure, business will not thrive in Africa (Luiz, 2010).

RATIONALE

The reason for undertaking this research is the undeniable fact that electricity makes the world go around, and by the almost basic need not being guaranteed in the future, the development prospects for real estate, specifically listed regional and super-regional retail real estate, look bleak. In short, without electricity, real estate is a dormant asset that cannot serve the purpose for which it was built (Roper & Beard, 2006; Wolde-Rufael, 2009; Nelson *et al*., 2010).

The current state of the nation sees retrospective electricity responses, i.e. back-up generation, rolled-out on a large scale within all sectors of business utilizing real estate, delays in the delivery of electricity generating power-plants such as Medupi, and huge strides for energy efficiency. All these temporarily mitigate the problem of electricity uncertainty, but do not offer a solution for the problem, which is electricity demand over-exceeding supply capability, coupled with a moving target of energy / electricity supply moving forward. One of the major obstacles identified while undertaking this research report, was the lack of relevant / related prior researches that directly focused on renewable energy generating retail property developments, as well as prior studies that could be referenced as possible contributors to the solution for electricity generating infrastructure constraints within countries that could not keep up with the demand for energy consumption both currently and going forward into the future.

From the literature it can be illustrated that some of the topics that have been touched on are:

conventional energy generation (techniques, cost-benefit analyses, sustainability, efficiency, etc.), success factors for retail property development, international energy infrastructure constraints, renewable energy development risk mitigation, renewable energy generation (sources, investors, feasibilities, costs, & technologies), the relationship between electricity consumption and gross domestic product, centralized energy production versus the decentralized energy production model, public infrastructure privatization, and sustainability (operational, environmental, materials, green building, and energy efficiency); just to name a few (Parker, 1999; Alanne & Saari, 2006; Herring, 2006; Luiz, 2010; Sharma, 2010; Wei *et al.*, 2010; Govt. RSA, 2014; 24th AMEU Technical Convention, 2014 / 15; Zuoa & Zhaob, 2015). These topics in isolation have been thoroughly researched and explored; but the difference with this current research is that it integrated some of the topics mentioned above and included the listed retail real estate component, in order to find a relevant solution for what is needed within Gauteng so far as energy security and retail property development prospects.

An investigation into what the next trend for real estate development, more specifically listed regional and super regional retail property development, was necessary within the South African context, as this was missing in the collective literature both locally and globally to-date, and could see South African listed retail developers spear-heading a movement based on our own findings that came from a drastic need. What this research has introduced is the idea of utilizing retail property as decentralized renewable energy production plants that can generate electricity in excess and plug back into the national electricity grid through an accepted process of smart-metering / reverse metering within the Gauteng region.

EMPIRICAL QUESTIONS

1. What are the current and transitional responses to an ailing energy sector within South Africa?
2. What are the development goals and forecasts for listed retail property developments within Gauteng for the next five to ten years?
3. What is the feasibility and sustainability of a retail property development integrating into the current energy grid?

4. Where could the possible niche markets and opportunities arise from the possibility of energy production decentralization?
5. What is the transferability of the idea and possible solutions being developed to cater for self-sufficient retail real estate developments?

LITERATURE QUESTIONS

1. Have other countries suffered similar electricity infrastructure constraints, and if so what were their responses to the problem?
2. What are the current relevant energy producing technologies and legislation within South Africa?
3. Should South Africa look into the privatization of public infrastructure that will be regulated by the Government / state parastatal?
4. What are the financial aspects to be considered when funding RPP (renewable power producer) energy projects?
5. Can the concepts of real estate and energy decentralization be fused to provide a developmental solution to the energy crisis?

PROBLEM STATEMENT

The South African economy has been found to be an energy intensive / or energy driven economy, rather than a growth driven economy (Wolde-Rufael, 2009); this puts the nation in a precarious position, where to grow the economy, electricity provision would have to be an absolute necessity for future sustainability. Property development is dependent on electricity supply and provision, in order for any development to meet occupational and development feasibility.

The traditional (fossil fuel generated) centralized energy production model, is proving insufficient and outdated for the current electricity challenges that the country faces; which in turn presents an opportunity for decentralized renewable energy generating models, that can coincide with retail real estate developments, and plug electricity back into the national grid.

RESEARCH STRUCTURE

The research has been formulated in such a way, that the research report discusses the research problem statement, the research structure, the literature review, the research

design, the research findings and analysis, as well as the research conclusion and recommendations; all in an effort to educate the reader on: the latest cutting-edge innovations within the energy sector, new perspectives and opportunities that present themselves through the current predicament the country finds itself in, issues not known or overlooked prior to this research, and an introduction of an element of innovation into the property development industry / sector in terms of electricity generation incorporated within real estate, within the South African context.

2 CHAPTER TWO - LITERATURE REVIEW

INTERNATIONAL TRENDS AND RESPONSES WITH REGARDS TO ELECTRICITY INFRASTRUCTURE CONSTRAINTS

The overriding question that brought this topic about was: have other countries suffered similar electricity infrastructure constraints, and if so what were their responses to the problem? The literature is looked to as a point of reference for the answer.

ELECTRICITY MARKET REFORMS

From the mid 1980's to-date, energy regulatory frameworks for various countries around the world have evolved, due to, the goals and benchmarks set by each nation being dependent upon its' specific energy requirement. The key aims for regulators were energy sector efficiency, as well as an introduction to energy market competitiveness; which were believed to result in a more streamlined approach to the business of energy production, a reduction in costs, and adding a greater value proposition for the consumer (Sioshansi, 2006).

Depending on the situation the country found itself in or even wanted to see itself in, one of five energy policy strategies were chosen, namely: restructuring, liberalization, privatization, corporatization, as well as deregulation (Sioshansi, 2006).

Sioshansi & Pfaffenberger (2006) describe the strategies as follows:

- Liberalization : an attempt to introduce competition in some or all segments of the energy market, while removing barriers of exchange and trade.
- Restructuring : an attempt to recognize the roles of the different market participants and outline what the regulators role in the industry would be.
- Privatization : encompassing the selling-off of government owned assets to the private sector.
- Corporatization : generally speaking, would be state-owned enterprises behaving as businesses in the private-sector would, and resembling in every-way a profit driven organization, although it is not.
- Deregulation : which is the lack of regulation of the electricity sector; which as described by the authors would be a near impossible feat, without including a monitoring body to act as a hands-off regulator.

The South African energy market, if to be described in terms of the headings mentioned above, would be categorized as an industry that has already gone through the act of restructuring; has gone through the act of liberalization; has always practiced the strategy of corporatization through a state parastatal; and has never been fully deregulated. This would mean that the South African electricity market has kept abreast with global energy industry standards, and is competing on a global scale with respect to energy.

ENERGY EFFICIENCY

Herring (2006) states that despite campaigns to reduce energy use over the last 25 years, national energy consumption in all the worlds' industrial countries has increased rather than decreased. She stated that the environmentalists believed that by improving the efficiency of energy, this would lead to a reduction in energy consumption; while the economists argued that by improving the efficiency of a factor of production, this would only lead to the lowering of its implicit price, making it more affordable and thus leading to greater usage.

By interrogating the economic theory described above in today's terms - as South Africa is looking into being a more Industrialized economy, shifting away from the consumerist status quo (NDP, 2030) - this would mean that the already pressured electricity production and distribution network, would suffer from an increase or a positive shift in demand for electricity (if the energy efficiency route is maintained), which would result in the national energy producer increasing prices over time to curb energy usage; which is what is currently happening.

Numerous energy saving campaigns within South Africa over the recent years, have advocated for a shift towards energy efficiency, through the switching-off of unused lights, the switching-off of pool pumps and geysers when not in use, a changing of electricity consuming products such as incandescent light bulbs into energy saving bulbs, and the list goes on. These strategies are mitigation measures and not a solution to the problem, and are policies utilized in order to avert load-shedding (rolling black-outs periodically necessary to avoid a total system shut-down).

The idea of energy efficiency cannot be the only response to the crisis of energy shortage, as it proffers no solution to the problem. In fact a merger of techniques is necessary that will

present energy producing alternatives, with a maintenance strategy utilizing energy efficiency principles.

NATIONAL & INTERNATIONAL RESPONSES TO INFRASTRUCTURE CONSTRAINTS

It is vital to get an understanding into how the problem of electricity security, has been dealt with by other countries and is currently being dealt with within South Africa; as this problem is not unique to South Africa alone. The following literature investigates the various responses in order to gain an understanding of where the global trends are leaning towards in terms of electricity generation, transmission, and distribution.

NATIONAL RESPONSES

The NDP (2030) – National Development Plan for 2030 of South Africa - envisions procurements of at least 20 000MW of renewable electricity (known as the 2010 Integrated Resources Plan), with the decommissioning of 11 000MW of ageing coal-fired energy infrastructure, and increasing investment expenditure in energy-efficiency.

These are the proposed electricity responses that will be actioned: (NDP, 2030)

- A reduction in carbon emissions from the electricity industry from 0.9kg per kilowatt-hour to 0.6kg per kilowatt-hour.
- Improve mining and mineral processing energy efficiency by 15%.
- Increasing grid based electrification to 90% country-wide, with non-grid options available for the rest.
- “The country would need an additional 29 000MW of electricity by 2030. About 10 900MW of existing capacity is to be retired, implying new build of more than 40 000MW”, (NDP, 2030, pg. 55, lines 34 – 37).
- A goal of at least 20 000MW of electricity generation to come from renewable sources.
- The industry as a whole should move to a less carbon-intensive electricity production process, by increasing hydro-imports, and increasing demand-side measures (enforcing energy efficiency).
- “Move Eskom's system operator, planning, power procurement, power purchasing and power contracting functions to the independent system and market operator, and accelerate procurement of independent power producers”, (NDP, 2030, pg. 56, lines 10 – 14) .

INTERNATIONAL RESPONSES

Adama & Sambodo (2015) explain that the Indonesian electricity market, has being dominated by one major state owned enterprise (Persero) who held in 2011, 77.8% of the energy generation share, while an IPP complimented the remaining 22.2%. It was found that there was a need to increase the role and share of IPP's within the electricity sector, as there were numerous negative implications to a continued running of a state owned parastatal, with the major draw-back being, government intervention in the running or management of the organization, due to social and political considerations; resulting in the parastatal not being able to pursue a profits-based approach in order to accelerate electricity supply within the country.

The authors also found that due to these interventions by government, the electricity sales price was far below the production costs, resulting in the parastatal running at a loss and needing constant bail-outs (Adama & Sambodo, 2015). This is similar in certain aspects to the South African situation, where Eskom has rights to produce 70% of electricity, IPP's have been legislated to provide 30% into the national grid in the future, and prices of electricity sales have been stated to be amongst some of the lowest in the world (Dept. of Energy, 2015). The argument to increase the IPP share reigns supreme in the reviewed paper, as it shifts aspects of the conventional business to the IPP's, while the state gets to regulate the entire market, with the aim of protecting the consumer, increasing energy production efficiency, and fostering private sector participation in the process.

Aliyu *et al*. (2013) discusses the case of Nigeria and their electricity crisis. The authors reported that the country was overly depended on petroleum reserves as well as its aged hydro-plant infrastructure for electricity generation which has slowed down developments in alternative fuels. The authors reported that the national electricity grid fed a total of 40% of the total population that was connected to it, electricity cost was reported to be 40% of the production cost, and the cost of production was reported as being nine-times higher than that of China. The authors expressed a need for diversification to achieve a wider energy supply mix, which would ensure greater energy security for the country. The drive was towards renewable energy technologies namely: nuclear, wind, solar and hydro-electricity, that would lower carbon-dioxide emissions, and reduce the dependence on fossil fuels.

Okafor & Uzuegbu (2010) respond to the above crisis in Nigeria by suggesting that renewable energy development is the best alternative to improving the electricity sector in Nigeria, but do not go in-depth in-terms of how they see the development happening. Oyedepo (2012) supports Aliyu *et al*. (2013), as well as Okafor & Uzuegbu (2010) by recommending that renewable energy & energy efficiency are the most favourable solutions that would take a huge capital injection, but would benefit the state by improving living standards, reduce dependency on fossil fuels, and achieve carbon-dioxide emission neutrality.

Awan & Khan (2014) discuss the energy climate situation in Pakistan. The Authors attribute the main reasons for the energy crisis to, rapidly increasing prices of hydro-carbon resources, and the lack of planning to foresee the increasing energy demand in the country. The authors state that renewable energy aids countries with depleting fossil fuels and increasing carbon emissions, to reduce their reliance on fossil fuels and tap into the existing renewable energy sources, and to deliver a carbon neutral response. The main contributors for energy generation in Pakistan are listed as: thermal power at 62.5%, hydel – hydroelectric at 33.6%, and nuclear 3.9%; with the share within the energy-mix of renewables being almost negligible.

The main point of contention is the cost disadvantage of investment in renewable sources; but the authors argue that, with increasing fossil fuel prices and abundant renewable resources, this could possibly bring about a grid parity (an alternative energy source that can generate power at a levelized cost of electricity that is less than or equal to the price that traditional technologies achieved, (Awan & Khan, 2014; REA, 2015) that could justify the initial expenditure.

The responses by the state were: Awan & Khan (2014)

1. An introduction of a feed-in-tariff (payment made to properties or businesses generating their own electricity through renewable resources, receiving an amount proportional to the output of power generated (Oxford, 2015)).
2. The planning of solar and wind power integration in the power system
3. An addition of other renewable resources other than hydel, to be connected to the power system.

4. The curbing of load-shedding especially in rural areas through the use of PV technologies: PV – photovoltaic technologies have been made available for household electrification, water-pumping, telecommunications, navigation, street-lights, etc.
5. Private sector participation in the promoting and upgrading of PV technology in the country.

Ramírez-Camperos *et al*. (2013) discusses one of the main arguments for a reform in the Mexican electricity sector as being, an aim to attract private investment in order to reduce the financial load on the government in infrastructure expenditure; further finding that the Independent Power Production modality, showed a greater participation rate from the private sector.

Marszal *et al*. (2011) discusses the EISA 2007 - Energy Independence and Security Act of 2007 of the USA – which authorized the NetZero Energy Commercial Building Initiative, which would support the goal of net zero energy for all new commercial buildings by 2030.

Schroedera (2013) investigated the integration of renewable energies into the German transmission grid, and found that the ten year network development plan, envisioned that power-generating resources were to be moved closer to demand centres; as a strategy to mitigate grid bottle-necks by the year 2030.

Awan & Khan (2014) mention that Thailand was one of the first Asian countries to introduce the FiT (feed-in-tariff) program, which topped-up payment to renewable energy producers, over-and-above normal energy prices that power companies would receive when selling electricity to the power utilities; going on to mention that Germany also has the largest installation capacity of PV systems in the world, reaching up to 32.4 GW of power in 2012.

These are but a selected number of infrastructure constraints around the world, and many more do exist. What is key to pick up though, is the general trend swaying towards IPP / RPP inclusion into the energy sectors; the push for carbon-neutrality; as well as the drive for a working together of conventional as well as newer renewable resources, not as two separate entities but rather as an integrated whole.

ELECTRICITY GENERATION REGULATION WITHIN SOUTH AFRICA

The overriding question that brought this topic about was: what are the current relevant energy producing technologies and legislation within South Africa? An understanding of these will assist in the understanding of the constraints as a whole.

BACKGROUND

Following the countries democratic freedom in 1994, access to conventional electricity was reported to be at 34% nationwide; this meant that the infrastructure at the time for energy production was geared to supply just over a quarter of the nationally demanded capacity, while 66% of the country was unconnected to the national electricity grid. Between 1994 and 2014 there has been a growth in electrification to the current level of 88%, illustrating over five million household connections to the national grid, which subsequently increased the demand for energy as we see it today (Dept. of energy, 2015). These have adversely impacted the energy supply of the country, resulting in the Government needing to recommission moth-balled power-plants, commission new power stations, and invest in new renewable energy resources, in order to assist in the electricity generating shortage.

One of the main arguments presented when evaluating the current lack of electricity security in the country is that, the Government should have preempted the knock-on effects of an increase in the energy demand when increasing electrification; while the accepted argument as published by the state is that, it has to be kept in mind that the Fiscal policy following 1994 had to place an emphasis on RDP's (Reconstruction and Development Programme), Growth Employment and Redistribution (GEAR) strategies i.e. resource redistribution, land redistribution, etc.; and couldn't from the outset invest in energy producing infrastructure to close the gap that was inherited from the previous regime (White paper energy policy, 1998).

Over the years the following power-plants were commissioned and decommissioned, landing us in the situation we currently in: Vermeulen (2015)

COMMISSIONED	YEAR	DECOMMISSIONED	YEAR
37 power-plants (mix of coal, nuclear, hydroelectric, and gas turbine)	1926 - 1990	18 power-plants	1926 - 1990
Matimba (Coal fired)	1993		
		Salt River 2 (coal fired)	1994
Majuba (Coal fired)	1996		
		Highveld, Taaibos (coal fired)	1999
Ankerlig (Gas turbine), Newcastle (Gas turbine), Gourikwa (Gas turbine)	2007		
Camden (recommissioned coal fired)	2010		
Komati (recommissioned coal fired)	2012		
Grootvlei (recommissioned coal fired)	2013		
Medupi (Coal fired)	Scheduled 2015		

TABLE 1 - ESKOM POWER-PLANTS FROM 1923 – 2015 AFTER VERMEULEN (2015)

As can be seen above, from 1996 following the Majuba power station commissioning, there has been no other developments until 2007; which then brought about three gas turbine power stations, and the recommissioning of three more stations over the years. Medupi was scheduled for 2015, but due to delays, is lagging behind on delivery and in turn is not in full production capacity as yet. This would mean that the country is not keeping up with constantly moving energy targets.

The Department of energy (2015) reports that Eskom supplies 95% of South Africa's electricity needs, and two-thirds of Africa's electricity needs; with approximately 90% of South Africa's power supply being generated from coal-fired power stations, 5% generated by nuclear, and the difference generated by hydroelectric and pumped storage schemes.

CONVENTIONAL ENERGY GENERATION SYSTEM / "STATUS QUO"

Eskom has control over bulk electricity (albeit not exclusive), operates the integrated high-voltage transmission system, and distributes electricity directly to large consumers. The business works through a bulk services sale agreement to municipalities, who then redistribute within their area denominations (Dept. of energy, 2015).

The states' economic energy regulator known as NERSA (National energy regulator of South Africa), has the following core responsibility: NERSA (2015)

- Regulating three sectors within energy: piped gas, electricity, and petroleum
- Boost private sector participation within the electricity sector
- Issues licenses and approves tariffs
- Insuring market competitiveness
- Development and evaluation of diversification strategies for primary energy resources

In 2003 as part of the power generation investment plan, the private-sector was allocated a 30% stake in power production and generation within South Africa, which is currently standing at 5% (Dept. of Energy, 2015; Stats SA, 2015).

Electricity produced within South Africa in 2014 decreased by 1.4% as compared to 2013, with 95% of all power being generated by Eskom. The annual electricity imports into South Africa increased by 18.6%, with exports decreasing by 0.7% within the same period (Stats SA, 2015).

The target for renewable energy reaching 30% of market-share is still a long way off and needs to be attained somehow; hence innovative solutions are needed to plug back into the national grid in order to input excess power and meet policy goals.

RPP'S (RENEWABLE POWER PRODUCER) & IPP'S (INDEPENDENT POWER PRODUCER)

The Department of energy (2015) states that, as part of the South African electricity distribution policy - regulating the EDI (Electricity distribution Industry) – one of the requirements was to establish a separate division from Eskom, which would merge with electricity departments of individual municipalities, and form distributed financially viable regional electricity distributors. Due to the transmission system being already monopolized, IPP's would then need to register through Eskom in order to plug into the national grid.

> In South Africa, an efficient regulatory body must be established that will grant all players access to the grid. For example, customers could buy from sources other than Eskom, such as the Southern African Development Community (SADC) electricity pool or IPPs, but still use the same transmission infrastructure to have power delivered to them (Dept. of Energy, 2015, pg. 1, line 27 - 30).

Through this above quotation from the department of energy, it is clear that the government is looking into alternative electricity production; the problem is that the government is still looking from a consumerism view, and is not assessing the possibility for "consumers" – possible energy entrepreneurs – to become the IPP's that provide the electricity into the grid; but Eskom is, through their IPP programme:

> It is crucial that the private sector plays a role in addressing the future electricity needs of the country. This will reduce the funding burden on Government, relieve the borrowing requirements of Eskom, and introduce generation technologies that Eskom may not consider part of its core function which may play a vital role in the future electricity supply options, in particular off-grid, distributed generation, co-generation and small-scale renewable projects (Eskom, 2015, pg. 1, line 4 - 6).

The above illustrates the need for this researches' proposed intervention and the need for the innovation as well.

Requirements when becoming an IPP in South Africa: Eskom (2015)

- Two Acts to be complied with: The National Energy Act of 2008 (No. 34 of 2008), and The Electricity Regulation Act of 2006 (No. 4 of 2006).
- Developments must use technologies identified in the Integrated Resource Plan (IRP) and all IPP procurement programmes namely: OCGT (open cycle gas turbine), CCGT (closed cycle gas turbine), pumped storage, nuclear, hydro, wind, CSP (concentrating solar power), PV (photovoltaics'), and others such as Biomass.
- Numerous programmes that the proposed development could fall under, namely:
    1. Renewable energy independent power producer programme (contributes to the 3 725MW output goal for 2020)

2. Medium term power purchase programme (power purchase agreements for approx. 400MW of co-generation and generation capacity)
3. Municipality generation and short-term contracts for security of supply
4. Small renewable IPP programme (SRIPP): accessing market appetite for small projects and market readiness for projects within the 1 to 5MW band.
5. Unsolicited offers: of which are described by Eskom as proposals which are outside the scope and timeframe of programmes under the IRP, but present a unique opportunity which could leverage strategic and economic benefit for the country. All of which are evaluated upon presentation to Eskom, NERSA, and Department of Energy; for any other proposals, these are dealt with by the SAE (Southern Africa Energy) business unit.

From the above list, this research / proposed intervention (electricity generating retail developments) could fall within category 3, 4, or 5, and would have to boast a mix of the appropriate technologies listed in symbol no. two; while the aim of the developments within this research will be to promote the development of RPP's and not just IPP's, as RPP's would strictly look into renewable resources while IPP's could still generate power using fossil fuels to a certain extent.

Keep in mind that the final categorization can only be defined once the achievable calculations have been run for the electricity production capability of a self-sufficient retail electricity producing development.

Through the cited practical legislation, it illustrates that the connection to the national grid is achievable, and depending on the electricity output that can be achieved, the intervention could be integrated into the national grid through an already existing IPP integration programme.

CENTRALIZED ENERGY PRODUCTION VS. ENERGY GENERATION DECENTRALIZATION

Should South Africa look into the privatization of public infrastructure that will be regulated by the Government / state parastatal?

Alanne & Saari (2006) state that conventionally, power-plants were large, centralized units that were known for utilizing fossil fuels as factors of production, while emitted large volumes

of carbon dioxide into the atmosphere. The authors identified a new trend that was developing towards distributed energy generation; which meant that energy conservation units were to be situated in close proximity to energy consumers, and large units were then substituted by smaller ones. They state that a distributed energy system was an efficient, reliable, and environmentally friendly alternative to the traditional energy system; and how in the ultimate case, distributed energy generation would mean that single buildings could be completely self-supporting in terms of electricity, heating, as well as cooling.

Dunn (2002) implies through his writings that, in the future the entire energy chain would be integrated into a building site. He describes how a virtual power plant could be presented as a solution for large areas where, the energy system consists of a centralized control unit, with numerous small local energy conversion units linked to it; and how due to every energy conversion unit having a connection to the public electricity grid, bilateral electricity trading could be possible.

The combination of the ideas and thinking above, are the core backing from the literature that, such interventions have been thought about, but no evidence has been put forth in terms of actual implementation; especially in the South African context, where retrofit is the order of the day, rather than new build energy generation and real estate / property integration. This is why this research is so vital from the progressive and developmental front for both property development as well as energy generation.

RISKS AND MITIGATION STRATEGIES TO BE CONSIDERED WHEN UNDERTAKING RENEWABLE ENERGY DEVELOPMENT PROJECTS

What are the financial aspects to be considered when funding RPP (renewable power producer) energy projects?

ELECTRICITY GENERATION MIX

Ryua *et al*. (2014) stated that for every development, current as well as future, five key targets should be considered when trying to optimize an electricity-generation mix:

- Carbon emission mitigation targets
- Energy security levels within the area of development
- Electricity generation costs

- The level of import dependency
- As well as the countries energy policy

These are the starting blocks for any future development and are questions that have been asked in South Africa, even though not thoroughly investigated through the literature as yet.

An interesting concept of zero energy buildings, is introduced by Marszal *et al*. (2011), and aligns to what the current research is trying to achieve; a self-sufficient building that can plug into the national grid to either demand electricity or supply it.

> The Zero Energy Building (ZEB) concept is no longer perceived as a concept of a remote future, but as a realistic solution for the mitigation of CO^2 emissions and / or the reduction of energy use in the building sector (Marszal *et al*., 2011, pg. 1, lines 22 – 25).

Marszal *et al*. (2011) describes the targets to be aimed for when attempting to achieve zero energy buildings:

- The metric to be used for evaluation (LEED, BREEAM, GBCSA, etc.)
- The balancing period
- The type of energy use included in the balance
- The type of energy balance
- The accepted renewable energy supply options
- the connection to the energy infrastructure
- The requirements for the energy efficiency, the indoor climate and in case of gird connected ZEB for the building–grid interaction.

It is vital to note that an electricity generation mix is essential, as taking a building completely off the grid is too costly, and would only be serving the individual rather than the whole; this is a national problem and not just an individual one.

RENEWABLE ENERGY PROJECT FINANCING

Agrawal (2012) states that renewable energy financing has been seen in the past, and in certain current situations, to be of high risk with regards to industry faith in new technologies, as well as future cash flows. Investors consider amongst other things, the provisions for:

- Performance risks during the developments life-span (technology guarantees)
- Market risk (the price at which power is purchased)
- Regulatory risks (power-generation cap by energy regulators)
- Whether the formation of an SPV (special purpose vehicle) has been completed in order to reduce financial risk contamination.

All of these factors are major considerations when sourcing investment from the capital markets in the form of debt, and need to be evaluated in terms of yield returns to the investors in the long-run.

Eichholtz *et al*. (2013) found that their research already suggested that property investors attributed a lower risk premium for more energy-efficient and sustainable commercial space; further noting that rated buildings provided a hedge against higher energy prices, and shifting preferences of both tenants and investors with respect to environmental issues.

Through this approach the necessary check-boxes that potential developers need to look-out for are cited, and the following section hones in on the delineated or identified investors for this research: REITS (Real estate investment trusts).

LISTED RETAIL REAL ESTATE SECTOR WITHIN SOUTH AFRICA

REITS

A REIT – real estate investment trust – is a company that owns, and operates income producing properties, and is publically traded on the JSE (Johannesburg stock exchange). It is an asset class that delivers capital appreciation and annuity income to all its' investors, ranging between small scale investors (once-off and passive investors), all the way to businesses being able to buy a stake in a portfolio; and is geared to investors looking for stable growing income returns over the long term (SA REIT, 2015).

South Africa boasts twenty-six REITs to-date, and to qualify as a JSE-listed REIT, the following must be adhered to: SA REIT (2015)

- Own a minimum of R300 million worth of property
- Earn 75% of all income from rentals or indirect property ownership
- Debt must be kept below 60% of the gross asset value

- And 75% of all taxable income must be distributed to investors each year

Properties that can be owned by a REIT:

South African REITs can own various property types i.e. industrial properties (warehouses, research and development, factories, etc.), commercial properties (offices, retail centres, hotels, etc.), specialized property types (hospitals, museums, etc.), and residential properties, all around the country (SA REIT, 2015).

South African REIT performance over 2014 is described by Mr. Pietersen as follows: the listed property sector outperformed other sectors on the JSE in 2014 with a sector return of 26.6%; bonds returned 10%, the All-share returned 10.9%, and cash returned 5 – 6%. South African property performed 3rd best in international markets, beaten by the USA at 48% return, and Australia at 28% during the same period. The listed property sector also out performed physical property returns, and allowed for diversification throughout property markets where Industrial was booming (Pietersen, 2015).

This investment vehicle is seen to be the most appropriate as many individual funders can contribute towards the developments and expect their returns over the long-run. The capital raising can be issued as stocks with a vested interest of the future returns allocated to the investor.

Eichholtz *et al*. (2012) discusses the effectiveness of having "green" buildings within a REIT, based on market information for the US economy: the authors find that the greenness of REITs is positively related to three measures of operating performance: return on assets, return on equity, and the ratio of funds from operations to total revenue; secondly there is no significant relationship between the greenness of property portfolios and abnormal stock returns, suggesting that stock prices reflect the higher cash flows derived from investments in more efficient properties; and lastly, REITs with a higher fraction of green properties, display significantly lower market betas (market risks), (Eichholtz *et al*., 2012).

The initial capital outlays can be funded by the REITs for as long as the return of the infrastructure investment pays itself back overtime. This has been proven through the reduced Opex (operating expense) reductions through the life-cycle of the property

development, as well as the added green premium that can be requested from leases (Fuerst and McAllister, 2011).

RETAIL SUCCESS FACTORS

There has been a huge drive thus far to convince the reader of the practical problem as well as the academic problem, but little has been discussed about what retail drivers are, and why this property type was envisioned over and above other property types.

Mourouzi-sivitanidou (nd) describes demand for retail space on a macroeconomic level, as being driven by population or household growth, increasing disposable incomes, metropolitan growth, and spending patterns; while from a microeconomic aspect, location, tenant mix, as well as project design reign supreme.

In order to conceptualize a self-sufficient energy producing retail development, one needs to identify a location that promises exponential growth in terms of development, increasing disposable incomes for the future, and an appropriate design that would both entice tenants and consumers alike.

In traditional retail demand assessments, retail space is demanded by each product line as a function of expected consumer expenditures (sales), as well as the space required by tenants per unit of sales; this would drive the size or category of a retail development and define its' capture / average catchment diameter of consumers around the development (Mourouzi-sivitanidou, nd). One factor that should be included for this research is the addition of energy production, and the unquantified revenues / sales potential that could be made when tapping into the existing catchments already primed for shopping.

Within South Africa, the following retail delineations are defined by SAPOA (South African Property Owners Association) as well as SACSC (South African council of shopping centres), and for the purposes of this research only relevant types will be discussed:

Type of centre	Size (m^2)	Trade area	No. of households
Small regional	Approx. 25 000 – 50 000 (75-150 stores)	Self-contained communities	17 800 – 35 700
Regional centre	Approx. 50 000 – 100 000 (150-250 stores)	Large region of a city and whole metro	28 600 – 57 150
Super regional	Greater than 100 000 (250 store and above)	Multiple metros	57 150 – 114 300

TABLE 2 - AFTER SAPOA RETAIL TRENDS, 2014

The chosen retail types for the research are regional centres as well as super-regional, as these would be in-line with REIT investment scales, and would justify the intervention by being able to cater to a household catchment of between 28 600 – 114 300.

ASSESSING THE TOPIC OF THE CONSUMER OF ELECTRICITY IN ALL OF THIS:

The proposed development, will be plugging electricity back into the national infrastructure grid; for this reason it would need to abide to one or a combination of the current revenue and systematic streams:

- Reverse-metering: an agreement where energy used by the property is billed at conventional rates, while energy supplied by the building is “paid back” by means of reversing the meter reading
- FiT (Feed-in Tariff): explained previously in the section of International responses to Infrastructure constraints
- Smart-metering system: in this system only the power needed by a particular development is used, and the surplus can then be redistributed through a smart-grid to locations where demand peaks
- Smart-grid: A pooling of smart-meters that communicate to a mainframe or control centre, and electricity can then be efficiently redistributed to where it is needed, or has been requested by any smart meter on the network
- Or Municipality generation and short-term contracts for security of supply

Through this way of thinking, electricity would be generated nearer to other real estate assets that would need electricity, and distribute electricity when necessary to the neighbouring properties during the times that the national grid is under pressure or through-out the day to supplement to supply already being received.

The supply of retail space:

For Developers retail supply decisions are a function of factor costs (capital, land, labour, and materials), retail property rentals, as well as growth forecasts for retail sales within a particular area.

When evaluating whether retail property development was the correct property type to spear-head the electricity generating trend, the above mentioned demand and supply factors held true in every-sense.

From the demand side, it is evident that electricity was a necessity, and the costs of electricity production could be recouped through various means; while from the supply side, an asset such as a renewable electricity generation for retail centres, would give the development a competitive advantage, would support consumer loyalty to the development, and secure future cash-flows from renewable resources all packaged to the consumer as an alternative to the conventional energy generating source.

GREEN BUILDING DEMAND

Eichholtz *et al*. (2010) state that the research area pertaining to the effect of energy efficiency and sustainability on financial performance in real estate markets has mainly focused on the individual asset; with the common question or area of research within the BOK focusing on, how “green” certification of properties is related to cash-flows and property valuations. The authors find that generally, the evidence shows positive financial effects associated with better environmental performance (Eichholtz *et al*., 2012); they back this further by stating that commercial buildings with energy efficiency ratings, command significantly higher rents, higher and more stable occupancy rates, and higher prices than comparable conventional buildings (Eichholtz *et al*., 2010; Fuerst and McAllister, 2011; Eichholtz *et al*., 2013); while lower levels of energy efficiency and sustainability have been associated with an increased risk of obsolescence (Kok and Jennen, 2012).

Nelson *et al*. (2010) found that various factors drove the spread and popularity of green buildings, namely: a growing tenant demand for the technology within buildings, due to reported lower operating costs of LEED, BREEAM, and GBSA certified buildings

- The general public expectations of the brand or the corporate company (branding or corporate image) with regards to the concept of sustainability: saving of natural resources (environmentally, as well as energy efficiency)
- Reported higher worker productivity, positively influencing profits of the business
- The enforcement of national building codes and regulations becoming stricter
- And investors looking for more socially conscious investments

These are some of the most common factors that need to be considered when considering South Africa's retail using sector, and their alignment with global and national objectives of efficiency, sustainability, renewable energy objectives, reducing carbon emissions, and corporate social responsibility (Govt. RSA, 2014; 24th AMEUTechnicalConvention, 2014 / 15).

The authors noted further that, consistent data sources for robust research, as well as metrics on green buildings were necessary; as these shortfalls within the literature, made a practical evaluation or feasibility of the profitability of green building investments difficult, and therefore held back stronger investor interest (Nelson *et al*., 2010).

METHODOLOGIES USED IN THE LITERATURE

Within the literature the following methodologies were unearthed, which illustrated how the data was collected and then analyzed:

Kaundinya *et al*. (2009) surveyed 102 articles from the body of knowledge relating to infrastructure connecting to the national infrastructure grid (not real estate), of which the findings were used to create a review paper on grid-connected versus stand-alone energy systems for decentralized power.

Wolde-Rufael (2009) utilized hypothesis testing in way of variance decomposition analysis & generalized impulse response analysis in linear multivariate models, with the results analyzed and interpreted through a modified Granger causality analysis.

In econometrics and multivariate time series analysis, a variance decomposition is used to aid in the interpretation of a vector auto regression (VAR) model once it has been fitted (Lütkepohl, 1991). A generalized impulse response analysis is viewed to be general because it is invariant to the ordering of the variables in a VAR (Kim, 2012), and the Granger causality analysis is a statistical concept of causality that is based on prediction (Seth, 2007).

Eichholtz *et al*. (2012) utilized a two stage regression model, matching data on LEED & energy star certified buildings with information on REIT portfolios, and calculated the share of green properties for each REIT over the 2000 - 2011 period.

Wei *et al*. (2013) conducted research based on logistical regression, whereby the authors normalized job data to average employment per unit energy produced over plant lifetime; following of which a meta study (The process or technique of synthesizing research results by using various statistical methods to retrieve and combine results from previous separate, but related studies (American Heritage Dictionary of the English Language, 2011)), of a range of articles is then done to extract ranges & averages of normalized job multipliers.

Morri and Soffietti (2013) reviewed the main assessment methods used to grade green buildings nationally & internationally, in order to spot differences and similarities between currently utilized rating systems. An overview of the additional costs and premiums for sustainable construction according to literature were then assessed, with a survey sent out to two groups who were considered to be real estate stakeholders (members in the green building council Italia and commercial real estate investors) through an online platform. And lastly Luiz (2010) and Sharma (2010) augmented the classic growth model, through the inclusion of energy as a factor of production.

An overview of the methodologies shows a heavy skewness towards a quantitative analysis, with thorough statistical influences and a hint of economic theory. For the purpose of this research, a qualitative approach was undertaken consisting of interviews, which allow for the interrogation into the direct subject matter, that of listed regional and super-regional retail developments, and into current knowledge pertaining to what industry professionals understand to be the problem, what has previously been done in other retail developments, and what the envisioned plan of action is.

FUSION OF REAL ESTATE AND THE CONCEPT OF DECENTRALIZATION

Can the concepts of real estate and energy decentralization be fused to provide a developmental solution to the energy crisis?

Eichholtz *et al*. (2012) states that from the literature, there was no convincing empirical evidence that shows the return on retrofits, or green investments for a building owner; with only systematic cost-benefit analyses at the building level.

This current research has picked up on what Dunn (2002), Alanne & Saari (2006), and Eichholtz *et al*. (2012), have identified, and has researched it in a South African context, building and infrastructure future-proofing perspective.

Possible spin-offs from the concept of concept fusion of real estate & electricity generation decentralization:

Wei *et al*. (2013) found that by building up a domestically produced clean energy supply, it was possible to provide energy security, reduce carbon dioxide emissions, and drive economic growth through the continual innovation and employment in the construction sector, as well as in the maintenance of the green infrastructure; furthermore, by investing in energy efficiency, the authors further stated that the money saved from what would have been energy costs, could now be used or redirected towards job creation.

Their paper found that the renewable energy and low carbon sectors, generated more jobs per unit of energy delivered than the fossil fuel-based sector; and amongst the common RPS (renewable power supply) technologies solar photovoltaics' creates the most jobs per unit of electricity output (Wei *et al.*, 2013).

CONCLUSION

Throughout this literature review, the major ideas that were focused on were: the current implementation and feasibility of electricity provision in South Africa, infrastructure privatization and energy decentralization, retail property development as a conduit for energy production, green building demand, and the concept of electricity infrastructure fusion with real estate.

Topics such as: what are the latest innovations to deal with the current as well as future energy provision concerns; what is the level of technology proficiency and acceptability within the property ambit locally; as well as the general market costs to make an idea such as this one possible; have all been assessed through the literature.

The idea of fully or partially privatizing energy generation, distribution, as well as transmission, was thoroughly assessed and in the researchers opinion, is what is necessary in order to get a competitive, reliable, efficient, system in place that will be regulated by the department of energy and administered by the private sector.

Energy decentralization would offer a solution to future electricity generation, and would introduce the idea of using large retail developments to become IPP's (Independent energy providers) or letting their buildings be used by IPP's to generate energy to sell back to the national energy grid; allowing the property to become a conduit for energy production. This would provide a new type of retail offering, which would follow core principles which have been developed over the years for retail success, while augmenting them with new ideas of renewable energy considerations, ever-changing tenant requirements, and the idea of future-proofing.

And lastly the concept of Real estate market maturity within South Africa would be another vital research sphere (of which was tackled empirically), that would help clarify where within this movement towards energy efficiency, energy provision, and renewable energy & sustainability, the country finds itself in. Interviews with industry practitioners (Asset managers, developers, tenants, etc.) have been conducted, in order to understand what the thinking is around the idea of utilizing retail developments as energy producing conduits and whether they see the idea being feasible, and this is discussed in Chapter four (4) which represents the feedback and analysis chapter.

3 CHAPTER THREE - RESEARCH PROCESS

RESEARCH OBJECTIVES

Empirical Q's	Objectives
What are the current and transitional responses to an ailing energy sector within South Africa?	The objective of this question was to interrogate the developments that have taken place over the years, which lead to the current situation with regards to the ailing electricity infrastructure in South Africa. Within this section, a full discussion into the state parastatals (Eskom) decisions made, as well as the policy amendments by NERSA over the years were delved into and understood. The areas of research touched on being namely: the current macroeconomic climate for retail property development, current listed property sector performance, current listed retail property performance, as well as green building developments for retail property over the years to date. All these were researched through academic journals, gazette information that was made public, as well as published books.
What are the development goals and forecasts for listed retail property developments within Gauteng for the next five to ten years?	Following on from the previous question: after the current situation had been fully assessed and understood, the development goals as well as forecasts for listed retail developments was necessary and was then assessed through interviews. In so doing, an understanding into the prospects and trends set to take place for the next five to ten years, were then directly extractable from the interviewees; allowing for a thorough analysis / informed decision making stance for this research to decide, whether

	to align to the standardized market vision, or to divert from the norm and become a first mover towards a new vision.
What is the feasibility and sustainability of a retail property development integrating into the current electricity / energy grid?	This section was vital and formed in essence the crux of the research, as it assessed the feasibility (cost, return, and investment strategy), as well as the sustainability (energy generation and real estate asset life-cycle) of new and future listed retail developments in Gauteng. The integration into the current electricity network, and the perception of high initial cost / Capex as well as how the two affected financial yields and margins of profit in the short-run, medium, and long run were discussed with interviewees and conclusions derived there from.
Where could the possible niche markets and opportunities arise from the possibility of electricity / energy production decentralization?	Within this section, the structured interviews / feedback, was focused on the possible niche market creation, green industry and electricity generation spin-offs, as well as the support to the national energy network that decentralized power-plants could provide; either to support the existing infrastructure or self-sufficiently provide / supply electricity to consumers.
What is the transferability of the idea of RPP (renewable power producing) retail developments in the retail development context, both nationally and beyond our borders?	The transferability of an idea is vital, as it investigates market maturity, tests the intervention in other contexts, and suggests project specific considerations to keep in mind when evaluating future listed retail developments.

TABLE 3 - RESEARCH OBJECTIVES

RESEARCH LIMITATIONS

- A vast amount of information about sustainability, electricity market reforms, and infrastructure constraints exist; but none directly speak to the impact of all the above mentioned in connection to Retail property, let alone property development.
- Literature exists internationally about energy efficiency, environmental sustainability, building sustainability, which are all mitigation factors; but none respond to electricity generation in the property development ambit.
- The information and the bulk of the sourced journal articles are internationally based; with none having been tested in the South African context.
- The BOK (body of knowledge) described smart-metering, decentralization of power-plants, and the use of renewable energy resources; but none tied back directly to property development, let alone retail property development.
- Within the literature surveyed, property development and energy generation have not been merged to find a solution for current electricity deficits.
- There was limited (one or two case-studies) to no research focused on commercial renewable electricity generation interventions in retail real estate development either around the world or in South Africa.
- There was limited research on retail property evolution over the years.
- Information recency was a problem as most of the relevant journal articles surveyed were more than 5 years old and were not entirely relevant in today's context due to developments over the years.
- A delineation / limitation is the size of the retail centres to be focused on, which were regional and super-regional retail developments.
- People's availability was the biggest constraint, as people's time lines differed and the professionals that were interviewed were constantly busy and preoccupied.
- Results are only be applicable to Gauteng, and may not hold true for other regions.
- The information provided by the industry practitioners were their opinions and were limited to this research.
- The project budget was tight, especially because it was from the interviewers' personal disposable income. An allowance had been made to accommodate fuel expenses, lunches with interviewees, as well as printing costs.

- The limited specialists in the field was truly a resource constraint, as finding the correct IPP specialist and property professional proved to be difficult, and proved to be a constraint.
- Following this proposal, there was very limited time to gather, analyze, and report on findings; every minute counted towards the final submission, but that is a general constraint throughout all researches.

RESEARCH ASSUMPTIONS

- The South African property development industry as well as the energy / electricity producing network, are ready for energy production decentralization within the Gauteng province.

This assumption has been stated only for the Gauteng province; the interviews touched on this topic and would further support this assumption. Dunn (2002) in his writings implied that in the future, the entire energy chain would be integrated into a building site. Alanne & Saari (2006) stated that conventionally power-plants were large centralized units, and that a new trend was developing towards distributed energy generation, which meant that energy units were to be situated in close proximity to energy consumers; resulting in large units being substituted by smaller ones.

- Future retail developments can become IPPs' / RPPs' that can plug back into the national grid through the idea of reverse metering.

The current fact of the matter is that as from 2003 the Cabinet approved private-sector participation in the electricity industry, permitting Eskom to have a 70% monopoly of electricity generation, while Independent Energy Producers (IPP's) would be granted a 30 % stake of contribution (Dept. of energy, 2015). The research picked-up from the policies as presented and introduced an option where real estate was a driver for electricity decentralization.

- Future listed retail property developments will be responsive to trends, opportunity, and tenant needs

Nelson *et al*. (2010) found that varying factors drove the spread / popularity of green buildings namely: growing tenant demand for the technology due to lower operating costs, general public expectations of the brand / corporate image, the reported higher worker productivity rates, national building codes / regulations becoming stricter, saving resources (environmentally as well as energy efficiency), a lower operating expense of LEED / GBSA certified buildings, and investors looking for more socially conscious investments.

RESEARCH DELINEATIONS

The location of the listed retail real estate assets, has been limited to the Gauteng province as a whole; the retail sizes were further refined to exclusively regional and super-regional developments. The listed property sector investors have been identified as REITs (Real estate investment trusts), and listed corporate property investors within South Africa.

Through this research, an exploration into the idea of self-sufficient, self-sustaining, electricity generating retail developments, is targeted. The assets could create decentralized power production plants that could produce electricity in excess, and plug back into the national electricity infrastructure grid; alleviating grid-connected electricity dependency, while simultaneously generating a product (electricity) that could be sold back to the grid to generate further profits for developers / landlords.

RESEARCH PHILOSOPHY

The philosophy employed within the research is interpretivism, which employed an abductive reasoning approach – a reasoning process that starts from a set of facts, and derives their most likely explanations (Vosloo, 2015) - resulting in a qualitative thesis.

RESEARCH METHODOLOGY

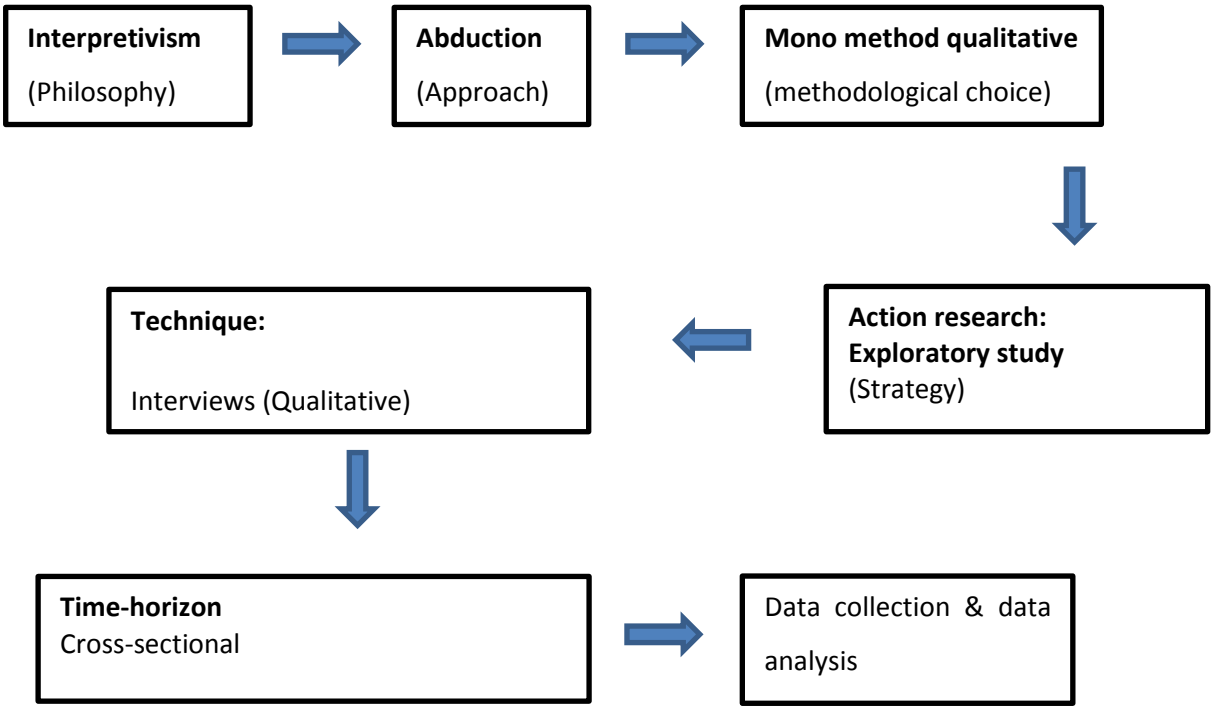

Figure 1 - RESEARCH METHODOLOGY

RESEARCH TECHNIQUE

The chosen technique utilized in this research was semi-structured interviews: due to there already being a set of themes that needed to be discussed, the possibility of additional questions arising from the interaction with the respondent, the necessity from time to time to explore the research question further through further questions that may arise, and the responses being captured through audio-recording.

These interviews were held with Retail property developers (dealing with the entire financial and physical package), an Architect (dealing with the physical asset creation), an IPP (independent power producer) energy practitioner (dealing with the modeling of energy requirements and strategies of decentralization of energy production), financial institution experts focused on renewable energy financing (funders of initiatives), as well as REIT or real estate fund managers (investors).

POPULATION

There were ten (10) participants that were interviewed, ranging between the ages of 25 – 65, with a minimum work experience within the property development and management industry of 5 years. This would see young professional influence, meeting seasoned professional opinion on the current problem facing the country.

This figure or number of ten interviewees was suggested by the University course coordinators upon ethics clearance as well as research approval stage, and was backed by Mark Saunders, Philip Lewis, and Adrian Thornhill in their book, research methods for business students, table 7.5 pg. 283 (Saunders *et. al*, 2012). The selected sample size would permit the researcher enough time to: co-ordinate and arrange interviews, record them, transcribe them, as well as analyze them, within the time constraints given to the researcher.

The interviewees were chosen / selected based on organizational authority, experience, and willingness to be interviewed. The participants that were interviewed, have affiliations to REITS SA (26 members); Nersa (National energy regulator of South Africa); the CBE (Council of the built environment, 6 members), as well as the GBCSA (Green building council South Africa).

By focusing on these groups, relevant, reliable, and factual information was attained, that was necessary for the success of this research.

SAMPLING PLAN

The sampling plan was one of non-probability sampling, with the method of self-selection sampling being utilized due to the purpose of this research being exploratory, as well as individual cases (if any) not being difficult to source or identify (Saunders *et. al*, 2012).

DATA COLLECTION

Interviews were conducted with relevant participants, and captured through voice recordings and with written notes where necessary.

- The questions where structured in such a way that they were concise and unambiguous.
- The interviewer was tasked with listening attentively to the interviewee, in order to engage in the conversation, and explore / analyze the points further.

- The approach used when formulating the questions, was to utilize a combination of open & closed questions; firstly, to allow the interviewee the opportunity to express themselves thoroughly, and secondly, to simplify the data analysis portion to follow, by being able to group themes / subjects.
- All interviewees received the same questions, with extra questions asked for clarity (if need be) in order to probe further into the argument.
- The interviews were captured through audio-recorded face-to-face interactions, then author transcribed into the document, and then analyzed; all within the amalgamated data collection and analysis chapter.

DATA ANALYSIS

Analysis technique for qualitative selected interviews:

The qualitative research was an interconnected process where the data collection, the analysis, and the interpretation were done per question; furthermore within the analysis the tone, body language, and context, was noted and described where necessary (Saunders *et al.*, 2012).

The data capturing technique that was used, was the transcription of those sections of each audio-recording that would be pertinent to the research; this aided in the cutting-down of analysis time and insured the conversation was concisely documented.

The next consideration (further analysis) was the identification of patterns between interviews and interviewees; these were achieved through inferences and at times were blatant.

- **Step 1 : Compiling data into a formal database**

The interviews were voice recorded and stored on stored on multiple devices.

- **Step 2 : Disassembling the data**

The data was then transcribed into the document under the main empirical questions, and further subdivided into further headings / questions to answer the overarching theme.

- **Step 3 : Reassembling (pattern emergence)**

Subheadings and questions were then divided into five (5) categories namely: current trends, feasibility, sustainable interventions, case-studies / facts, and future recommendations. Through this subdivision, that technique of pattern emergence was utilized in order to group the relevant interviewees' comments together in order to build-up a narrative in line with the empirical question being answered.

The overriding skills necessary in order to execute the analysis were:

- Rigor (the constantly checking for data accuracy and consistency).
- An open mind as well as constant comparisons between interviews and comments.
- The ability to develop rival explanations / arguments.
- As well as the continuous posing of questions and probing into answers.

- **Step 4: Interpretation**

Within this section the researcher utilized their own discretion in order to connect the dots and formulate an argument in the answering of the empirical questions at hand.

- **Step 5: Concluding**

Each empirical question received a miniature summation in order to make sense of what was being answered within it; the overall conclusion of the research followed in chapter five (5).

ASPECTS OF VALIDITY AND RELIABILITY

The validity of the interview questions was put to the test in terms of answering / measuring what it was that the question was meant to measure: content validity as well as construct validity was verified through researcher and supervisors' judgment.

OVERCOMING INTERVIEWER AND INTERVIEWEE BIAS

Supply of information prior interview: a participant information and consent sheet was sent to all participants by email; interview themes and topics were provided as guidance and introductory reference to all participants. This was the best way of giving the interviewee an opportunity to digest the subject matter and read-up if necessary, in order for the interviewer

to extract as much valuable insight as possible. The questions were then forwarded two days prior the interview, to allow the interviewee time to prepare.

Appropriateness of interview location: the interviews were conducted in the interviewees comfort zone, either their offices or a restaurant.

Interviewer dress-code: to all these meetings, the interviewer was appropriately dressed, as if going for a business meeting / interview; this was done in order to be taken seriously by the interviewee, and to fit in with the corporate nature of the surrounds.

Question set-up: there was an avoidance of leading questions, and an appropriate use of open, closed, as well as probing questions to keep the interviewee thinking and captivated.

Avoidance of misquotation upon data capture: each interview was conducted with a voice-recorder present with the consent of the interviewee, and a copy of the recording was made accessible upon request through an online cloud service i.e. Dropbox; each interviewee had and still has access to their own interview recording.

Level of knowledge about Interviewees Company or their role within it: this was done as a due-diligence exercise in order to help put the interviewee's mind at ease, by illustrating that the company was the correct one to answer the questions pertaining to the interview, as well as they being in fact the correct person the interviewer intended to interview.

ETHICAL CONSIDERATIONS

- Research interview questions have been approved by the ethics committee.
- Interviewee's informed consent was received.
- Awareness of interviewee bias was always at the back of the interviewers mind.
- There could have been a lack of perceived value to the organization by the contacted gate-keeper, who would have subsequently limited access to the correct person that could answer the questions; this was another consideration that was kept in mind.
- Concerns of confidentiality of the business trade-secrets needed to be addressed through a consent form process, where privacy and anonymity were guaranteed.
- Perceptions about researcher credibility were mitigated through a valid letter from the school that accompanied the PI (participation information document sent to the interviewee prior the interview).

- And lastly, all information in the public domain was cited and referenced correctly in an effort to not plagiarize.

4 RESEARCH FINDINGS & ANALYSIS

DEMOGRAPHICS

Within this section, the people that were interviewed for this research are described, and their credentials mentioned in order to confirm authority on the subject matter at hand.

	INTERVIEWEE	INDUSTRY EXPERIENCE	AREA OF KNOWLEDGE
1.	Sokhululeka Didiza	< 5 YEARS	Green specialist at GreenCape
2.	Ian Curry	> 10 YEARS	IPP Owner and Specialist
3.	Edgar Semenya	< 5 YEARS	Property Asset Manager at Semrock (Pty) Ltd
4.	Ikageng Kekana	> 10 YEARS	Nedbank Head: Regional Advances Credit
5.	Matthew Friedland	> 10 YEARS	Architect and Green design specialist
6.	Helen Mutshekwa	> 5 YEARS	Asset manager in PIC
7.	Mabuse Moja	> 5 YEARS	Asset Manager MSM property fund
8.	Mveleli Nqwazi	< 5 YEARS	Assistant development manager Billion group
9.	Jackline Okeyo	> 5 YEARS	Head of operations and business development at Nthwese developments
10.	Werner Van Antwerpen	> 10 YEARS	Head of Sustainability (Energy) at GrowthPoint Properties

TABLE 4 - DEMOGRAPHIC SUMMATION

Sokhululeka Didiza

Ms. Didiza is a member of the Cape Town based sector based development agency GreenCape, which focuses on supporting accelerated investments towards the South African green economy. She works within a specialist team of energy experts, who look at unlocking employment as well as manufacturing potential within the South African green economy.

One of Ms. Didizas' key responsibilities include: building relations with key industry bodies and stakeholders within various economic sectors, such as the construction and industrial sectors, with the aim of facilitating energy efficiency developments across the board.

Prior to this appointment, she spent 6 years in management consulting within various sectors. Her advisory experience includes authoring "Vision 2020 defining the course of an inclusive economy", reported on behalf of the National empowerment fund (NEF), a South African Development funding institution. Another key publication is "Greening the construction sector", market intelligence report which was published in 2015.

Her academic qualifications include a Bachelor of Economic Science degree from the University of the Witwatersrand, as well as a post graduate qualification on Sustainable Development Planning from (Stellenbosch University).

Ms. Didiza is a trusted advisor on sustainability matters, and is currently active in various entrepreneurial leadership organizations including the African Leader Academy student enterprise (SEP) programme, Common purpose South Africa, and Global clean technology Innovation South Africa (GCIPSA) programme (Didiza, 2016).

Ian Curry

Mr. Ian Curry is the former Managing Director of Basil Read Energy (Pty) Ltd; within this period of leadership his focus was on the development of funding structures, the owning and operation of utility scale power generation, and energy storage assets in Africa. These assets used renewable and clean primary energy resources, delivering electrical energy to customers.

Mr. Curry, previously held the position of General Manager in the Energy Division at TWP Projects (Pty) Ltd, where they provided services to the renewable energy and power

generation industry in Africa. He is a registered Professional Engineer with a degree in Electrical Engineering from the University of KwaZulu-Natal, an MDP from the University of Cape Town's Graduate School of Business, and a post-graduate qualification in Environmental Engineering (Curry, 2015).

Edgar Semenya

Mr. Semenya was approached at a networking event for the South African Institute of Black property practitioners, where the comments made during our introduction resonated with the research topic at hand. Mr. Semenya studies his undergraduate degree of a bachelor of science in property studies at the University of the Witwatersrand; thereafter joined JHI as an Operations Manager. He then went on to work for City Property Administration as a Property manager, where he was then exposed to retail and residential accommodation.

Mr. Semenya is now a property entrepreneur, with the vision of owning retail property in the future, while running his company Semrock (Pty) Ltd as a property asset manager.

Ikageng Kekana

Mr. Kekana is currently Head of Regional Advances in Credit at Nedbank. For a period of four years prior that, he was the senior credit manager for property finance still with Nedbank.

Mr. Kekana has held numerous posts as a credit manager for Africa operations with ABSA Bank, Credit evaluation manager in property finance with Standard Bank, a credit consultant in commercial property finance for ABSA Bank, and the list goes on.

Mr. Kekana completed his Bcom (Accounts) from the University of the Witwatersrand, continued to the University of Johannesburg where he completed his Bcom (Hons) degree in financial management; and is recently completing his Master of Science (MSc) Property Development and Management from the University of the Witwatersrand.

Matthew Friedland

Mr. Friedland has ten years' experience as an Architect, and five years as a Green design specialist. Throughout his career, he has been an educator of sustainable design and development, as well as an accredited Greenstar SA professional, graduating from the University of the Witwatersrand with a Bachelor of Architecture degree.

Helen Mutshekwa

Ms. Mutshekwa currently holds the position of Asset manager in a commercial and industrial dominated portfolio within PIC (Public Investment Corporation). The assets managed are within Gauteng, mostly located in Midrand and Centurion, and consists a portfolio of 40 properties to the value of R3.4 billion. The primary goal for the portfolio under management is the long-term sustainability of the Assets.

Ms. Mutshekwa graduated from the University of Cape Town with a Bachelor of Science (BSc) Honours in Property Studies; she went on to work for Rand Merchant Bank Properties on a graduate internship programme, and through a restructuring / company buy-out, she was absorbed into ERIS group. She worked her way up and was eventually absorbed by the Asset management division within Eris group, being Emira property fund, where she spent four and a half years prior leaving for PIC.

Mabuse Moja

Mr. Moja graduated from the University of the Witwatersrand with a Bachelor of Science (Property studies) degree; he then went on to work in valuations at Nedbank for two years.

Mr. Moja progressed to Investec Bank in Cape Town where he was absorbed as a junior Analyst, assisting in the due diligence process of potential stocks for investing pension fund money into real estate. He then transferred to Johannesburg, where he was retained in the Investec property division, as a listed property Analyst.

After a few years with Investec, now Mr. Moja finds himself as a Director in MSM Property Fund.

Mveleli Nqwazi

Mr. Nqwazi is currently a Development Assistant, identifying development opportunities for shopping centers around the world, at Billion Group. His core role is to drive the bottom line before operation takes place.

Mr. Nqwazi's background entails being a Quantity Surveying Technician, and a Business Analyst, prior joining Billion Group. He currently holds a B-Tech in Quantity Surveying from

the Nelson Mandela Metropolitan University, as well as a qualification in practical project management.

Jackline Okeyo

Ms. Okeyo graduated from the University of Cape Town with an honours degree in property studies, and went further by attending the UCT School of business, where she completed an executive course in the property development programme. She went on to join Investec Bank as a graduate intern, and practiced as a property developer for five years thereafter within Investec.

She is currently heading operations and business development for Nthwese developments: a rural and peri-urban retail property development company that sells certain assets within the portfolio to the listed sector.

Werner Van Antwerpen

Mr. van Antwerpen joined Growthpoint Properties as a Sustainable Development manager, then moved on to become the Head of Sustainability (Energy), which is his current position; he leads energy / water efficiency, renewable energy, utility management, green building office development, and strategic projects nationally, over all sectors.

Mr. van Antwerpen previously held the position of chairman of (Sustainability) at SAPOA (South African Property Owners Association), coming from an executive lead role as Senior Manager for a management consulting firm Deloitte.

He holds an MBA from the Hult International Business School for finance and innovation, and a PhD in Nuclear Engineering from the North-West University (Van Antwerpen, 2015).

ANALYSIS PROCESS

RESEARCH QUESTION

What are the current circumstances, transitional responses, and possible solutions to achieving energy self-sufficiency in listed regional and super-regional retail developments within Gauteng?

RESPONSES

The questions and sub-questions to follow were gathered through personal face-to-face recorded interviews with industry professionals, and were aimed at answering the main research question above. The interviews were conducted over a period of four (4) months from October 2015 to February 2016, due to the researcher only receiving ethics clearance in September of 2015 and the interviewee's schedules all varying towards the end of the year 2015. The average interview time was one hour forty-five minutes 1hr 45min, and began from a level of actually understanding the person to be interviewed, and went on further to delve into the research questions that were sent prior the interview. The actual interview can be reviewed / viewed in the annexure section below, main heading seven (7) annexure A.

As will be illustrated in the responses, there are many possible ways of interpreting a question, but the answers have been grouped / presented in such a way that they followed the technique of pattern emergence / emergent theme analysis, in order to formulate a structured and fluid set of common points to answer the question from a combination of answers from interviewees.

The presentation of the findings is addressed by giving the general or majority findings per theme, prior delving into the individual responses per interviewee. This assists by allowing the reader to gain an overall picture of the theme as well as the findings, prior delving into understanding the individual and detailed responses that assisted in the summation / the findings.

EXPLORATORY QUESTIONS

FIRST THEME: THE CURRENT AND TRANSITIONAL RESPONSES TO AN AILING ELECTRICITY SUPPLY SECTOR WITHIN SOUTH AFRICA

The objective of this topic, is to gain an understanding as to, what is happening within the South African economy when it comes to electricity supply, generation, as well as distribution, at a macro level. Through this research, one would delve into possible implications drawn from the current status quo, and a transcendence towards current market movement / interest.

- **THEME RESPONSE SUMMATION PRIOR DELVING INTO DETAILED RESPONSES**

CURRENT MARKET SENTIMENT

It was found and reported by the interviewees that, due to an ailing electricity supply in South Africa, property development of commercial buildings could slowdown drastically; the development would be hindered by negative investor confidence, which in turn would have a negative influence on the national GDP / economy in the medium to long run. Current trends see neighborhood / community lifestyle centres mushrooming all around Gauteng, with back-up generation offered to the tenants who occupy them; this may be a trend we are seeing in smaller retail unlisted and to a certain extent listed commercial institutions, but the focus of this research which is focused on regional and super-regional listed retail developments, these are mere observations.

The development sentiment throughout the interviews directly pointed to the fact that, without electricity security, there would be no business (property or otherwise); for this reason we would all need to buy into the idea of “going green” (planning towards a property development vision that would be both sustainable and works towards self-sufficiency), and not only focus on profitability, which is a short term objective that is detrimental to the eventual goal.

It was mentioned that a lack of energy / electricity security, had been identified as one of the barriers of doing business in South Africa, and that the country was an energy intensive economy; for those reasons, it was crucial to secure the supply of electricity moving forward,

as well as make provision for future electricity generation through renewable energy (electricity) resources.

When relating back the above sentiments to the literature, Herring (2006) states that despite campaigns to reduce energy usage in the past, national energy consumption in all the worlds' industrial countries had increased rather than decreased. This would mean that, as South Africa has aspirations of international level competitiveness in terms of industrialization, that for them to achieve these goals there would need to be more energy usage, which would land the country in a conundrum as to which strategy to push forth with, that would meet all its' objectives without increasing levels of pollution / fossil-fuel usage and dependence on the national existing infrastructure. For this reason RPP's (renewable power producers), and furthermore decentralized power plants need to be considered in order to present a solution from the private sector side and not only depend on the Government for a solution. The country has for years depended on fossil-fuel intensive electricity generation, and has to move towards sustainable resources of energy production in order to remain relevant in the sustainable discourse taking place internationally, and as agreed to in the UN charter.

This research goes a step forward in trying to hone in on what those possibilities could be in the listed retail commercial property development ambit, and how to secure self-sufficiency in electricity generation moving forward.

When touching on feasibility, it was agreed upon by the majority of interviewees that, any property development project was a factor of finance, developers profit, time, risk, project completion, and market entry, just to mention a few; all of which contributed to the retail property development industry being an incredibly constricted sector by way of maneuverability. This would mean that current market sentiment, still has it that energy sustainability or building self-sufficient buildings, is more expensive, more risky, the technology is relatively new with no track-record, and could be a possible profit delaying variable added to the equation / conventional formula. Another way of stating the market sentiment was that, the increased project finance risk, completion risk, and Contractors P&G's, would result in the overall development costs being passed down to the tenant and eventually the consumer, further placing pressure on the system, of which the market may not be favourable to such an introduction currently. For these reasons the low hanging fruits

(solar panel installations, changing of light bulbs, the regulation of HVAC systems, etc.) when it came to sustainability and energy efficiency, were targeted by developers, and were seen as deemed to comply / deemed to satisfy with the current market sentiment as well as market expectation.

TRANSITIONAL RESPONSES

It was found that several policies had been introduced by the Government in order to incentivize the nation into utilizing less electricity, but not enough had been done with regards to electricity generation at a micro scale. The utilization and commissioning of IPP's (independent power producers) and RPP's (renewable power producers) was one thing, but the pace of development was still over exceeding electricity supply capability. It was agreed by the interviewees that energy efficiency had its' place within the economy, but was not the solution to getting out of the situation the country was in.

To illustrate that the country is moving in the right direction, the share of IPP's and RPP's has increased, reflecting price parity between technologies; this bodes well for the renewable resources / green economy, and contributes towards electricity generation and not only efficiency. The interviewees further agreed that a lack of creativity by developers and the fear of going against the grain of the tried and tested formula, were the key stumbling blocks in energy generation migration, and in-fact compliance, and could only be solved through legislation.

- **DETAILED & INDIVIDUAL RESPONSES**

  Question 1: In your opinion, what would a lack of electricity security mean to the property development industry in terms of sustainability, self-sufficiency, and feasibility?

CURRENT TRENDS

Ikageng Kekana responds by describing an environment where there would be a slowdown in the conceptualization as well as the physical building of commercial property, resulting in a slowdown in economic growth, which would ultimately affect all property types. He carries on further to say, a lack of electricity security has also been seen as one of the barriers of doing business in South Africa; which is a sentiment shared by Mabuse Moja, who added that without electricity nothing (property development related) would be able to make it out of

the ground, let alone operate at an optimal level of production. Helen Mutshekwa describes it as being catastrophic; where “without electricity there is no business”, she emphasizes. Werner Van Antwerpen supports that statement by adding that, where there is a lack of electricity, it stifles progress and development.

With conventional property development, one of the critical services that had to be secured was the provision of energy / electricity supply; this was applied for when submitting to the local authority for construction approval. Looking into what this thesis is questioning, why can there not be an alternative method of application whereas the property to be developed, supplies its’ own power provision, and applies to plug back into the national infrastructure grid; this is what the researcher has been contemplating and is in fact suggesting as a way forward for self-sufficiency.

Mabuse Moja describes how in the past, land could be bought and power secured through deals with Eskom and the municipality, and how of-late the battles are not for land and zoning, but the power issue; namely what can be supplied, versus what has been designed for in the existing electricity grid. What began being evident in the markets was that the developers with the good land (serviced or higher electricity provisioned land) were receiving all the developments and those with unsecured power where left wanting.

Ian Curry is quoted in saying, “it may sound a little cliché but, energy (specifically electricity) is the enabling force that drives the economy no matter where you are”, those countries with the least developed economies and infrastructure, and typically have the least access to electricity.

Songo Didiza described a lack of electricity supply as a driver of a multitude of uncertainties in the property development industry, mainly at the occupational level: operational costs of a building mainly accrue from electrical appliances in the building (HVAC, lighting, water heating, etc.), which in the short to medium term, a high Op cost creates difficulties at the customer level (i.e. tenants) who expect the building to come with aforementioned municipal services (water, electricity) attached to it as it is detailed in the lease. With that being said, an effect of all this when the national electricity grid gets overloaded, is load shedding, which comes with significant costs to businesses that are unable to operate during these periods, and causes inconvenience to residents. As much as some landlords say this is a tenants’

problem, when small tenants have consistent blackouts, they not making revenue and just point-out the fact that they cannot afford the rental for that month or even months to come, mentions Edgar Semenya.

As a result certain commercial developers, both for community centres as well as larger regional malls, have begun exploring alternative means (fossil-fuel operated back-up generators) to ensure their energy security, which often means more Capex. As much as this measure could be seen as a grudge purchase, it insures tenants that if and when the system collapses, they will receive power for essential services such as the till / cash register, necessary lighting, as well as necessary refrigeration.

The following South African energy market summation by Ian Curry, illustrates a few current as well as transitional responses that the market has embraced as a response to the need:

Grid supplied electricity, be it through a municipality or a national utility, typically tends to be low cost, reliable, and monopolized. The only alternative that was considered to-date with regards to property was stand-by generation, which to a large extent was diesel / petrol powered, and contributed tremendously to pollution and greenhouse gas emissions. Developments that had access to gas or were on a gas-line, were at an advantage over the rest, as tri-generation could also be a consideration when coming to power generation. When honing in on retail, it is absolutely critical to keep power going; especially food retailers and restaurants, which by putting in back-up power as a sustainability tool, the landlord could then retain / attain higher quality tenants, which would in turn increase income, reduce vacancy, and increase the value of the property.

FEASIBILITY

The second topic that was a common theme amongst the interviewees, was their understanding of the current building climate as well as green building feasibility:

Matthew Friedland stated that, amid the constant sense of fear that a development would not be completed on time; the escalations alone could kill a project, which could be the difference between a return or a loss to a Developer. This forced the entire project team to juggle between a building efficiency of approx. 80%, with an expected return of between 7% – 12% generally speaking to the developer, as well as an extremely high cost of finance. All

these factors in his opinion made the retail industry an incredibly constricted construction and development sector by way of maneuverability; he further stated that:

> "Everyone are just so used to doing things this way, that they are used to powering through and getting it done, without sitting and planning for energy security", (Friedland, 2015).

Mveleli Nqwazi responded in the same manner, by pointing out that by going "green", the capital outlay would automatically be expanded prior to construction, making it very risky to undertake any development. The contractor from the tendering stages prior appointment would price for higher P & G's (overhead costs in any construction project that cannot be attributed to any specific thing) due to their uncertainty of conditions and workmanship, which all ultimately would be driven down to tenants by developers or even squeezed out of the professional team, in order to keep the scheme feasible. The only way to get away with driving the cost to the tenant is if the tenant was optimistic about the future prospects of the development in terms of, potential foot-traffic, profitability, and longevity of the developments' trendiness and appeal to consumers, while critically also being able to absorb the knock in their future projections. Ms. Mutshekwa supported the above statement and further added that the smaller "guys" (tenants) would not be too keen on absorbing costs for the development; that would be because they would not know what their sustainability / profitability would be in the next three to five years, and were not into the development based on a lifetime return.

From the paragraphs above, it is evident that the development game is one that plays with tight margins, and any deviation from the "status quo", is met with a sense of "we'll get to it one day once legislated or compulsory", resulting in projects reverting back to conventional ways of planning and execution, all due to systematic constraints that are not challenged.

A possible solution to making retail green / alternative investments feasible is discussed by Edgar Semenya and Jackline Okeyo, who state that with the propensity for smaller tenants to defaulter, would mean that listed and blue-chip tenants would make the most sense to undertake such large co-investments and risks with the developer, as the money spent as capex could be recouped through long term leases.

This is not a farfetched idea, as nationals are already moving into developments with backup generation for their own stores, with the costs borne by the developer and factored into the leases. Therefore in essence, the current development climate coincided with the saying that, keep the costs as low as possible and let the tenant deal with the sustainability legislation once the building is up; which is a sentiment shared by most of the interviewees until legislated change is enforceable. To conclude, Matthew Friedland added to this by stating that, if it was a toss-up between capital costs (Capex) and running costs (Opex), developers would always look to capital cost, as in that was where their immediate returns would occur.

CURRENT SUSTAINABLE INTERVENTIONS

A common trend in all interviews was the common thoughts on sustainability, i.e. the changing of light bulbs, the alternation between peak and off-peak loading of HVAC systems, and photovoltaics'. The one concept that was easy to relate to by every interviewee was the photovoltaic solar panel farm on top of a shopping centres roof, as the sheer footprint of the roof coverage would be directly proportional to the electricity that could be generated. A major concern though identified throughout the interviews was the cost of clean electricity production, versus conventional electricity production, as well as the benefits thereof.

ELECTRICITY PRICE PARITY

Matthew Friedland explains that, as of late electricity price parity has been reached, and if a consumer were paying City Power (Johannesburg's energy producer) for electricity, solar power would come out cheaper when comparing the CTC (cost to consumer). He continued to explain that if an IPP were to go up against Eskom, which produces conventional utility scale electricity, renewable energy generation would not be able to work out cheaper, just for the mere fact of economies of scale; but did confirm that the developments in technology were quickly closing the gap.

Werner van Antwerpen discusses the pitfalls related to cheaper and conventional electricity generation, versus the renewability argument:

The concept of notional maximum demand: this is the amount of energy Eskom supplies to a site / development / consumer, and is like a pay or take system where if the development does not utilize the full capacity provided to it, the energy is lost even though it has already

been paid for. Another issue with the current transmission and distribution system is that, if the development in the future needs to increase the electricity capacity (the notional maximum demand, due to rezoning or a different building occupation use), from let's say 4MW to 5MW, there now is no flexibility / capacity for the increase; this is when alternative sources are looked to, to supplement the existing developments electricity capacity.

> "Smart-grids and sub-utility electricity generation could be the way forward" (van Antwerpen, 2015).

Matthew Friedland then illustrated a rule of thumb quick calculation, just to illustrate what a sub-utility generation plant (possibly a mall) could achieve just from solar PV:

For example if a development has 15 000 – 20 000 sq.m of roof space, optimistically generating approximately 250W per 1.4 sq.m, call it 200W per square for arguments sake, this could potentially produce ((15 000sqm/1.4sqm)*200) = 2.14MW of power just off the roof, representing a quarter to a half of the electrical demand generated by the center during peak loading periods.

If you apply the formula above to not only the roof area but to the parking as well, where you can get up to a 1:1 or 1:2 coverage ratio of usable solar area; then the numbers begin making sense ((35 000 / 1.4)*200 = 5MW, which gets closer to the power capacity the mall needs.

Through the above illustration, sub-utility and development self-sufficiency is achievable when the notional maximum demand is not matching developmental goals or the building itself is trying to remove dependence from the grid. Ian Curry as well as Matthew Friedland agreed that, the key to solving the power crisis in South Africa would be a power mix for achieving maximum efficiency. This could be a sustainable possibility to reducing and removing demand from the already loaded national grid.

CASE STUDIES

Matthew Friedland discusses a project he is busy with in Nigeria and describes what is happening beyond our borders:

In Nigeria for example, a typical development has back-up generators that can run a building 24 hours a day and 7 days a week, water treatment facilities, and sewer treatment facilities

all on one site. These are all independent of local conventional power that provides 20% of the electricity needs of the development, subsequently forcing most developments to go off-grid in essence. Therefore a lack of energy security has no impact on a country like Nigeria, which has accepted its short-comings in terms of power supply, and has progressed to a developmental state of being, where developers have created a formula that is efficient, sustainable, and is economical (even when the cost of construction is between 50% – 100% greater than in RSA. The cost inflation is due to almost everything being imported, but the key is that the formula for development still remains feasible, and the creation on self-sufficient developments has become a reality as a response to a problem.

Ikageng Kekana adds his experience with a local case-study:

Loch Logan retail centre in Bloemfontein (transaction handled by Nedbank), was rethinking the whole idea of recovering 100% of electricity from tenants. When the business case was put forth, the main issue was that, year-on-year increases from Eskom could not be guaranteed and tenant security was important to the Developers. The retail centre and it's management opted to install solar panels to the value of R60 million on the roof, which allowed them to hedge the escalations of electricity usage, by guaranteeing a fixed escalation of for example 6% in perpetuity rather than a 15-20% hike as needed or permitted by NERSA. This strategy allowed for a dual system usage of on and off-the-grid electricity supply, where if the alternative electricity generated was not enough, the rest could be found from the conventional grid.

It was found that the solar panel guarantee period was 20 years, with a payback period of 7 years; allowing for the remaining 13 years of profit before there might have been a need to replace / recapitalize on the infrastructure. The PV (present value) that the bank generated for the solar installation was R80 million, the cost was R60 million to install them, allowing for a potential R20 million uptake in the retail developments value as a result of the solar installation. The main concerns raised by the Bank were product guarantees for the roof and panels, the fixture to the existing or new roof, and confirmation of insurance approval for the installation for bank security. Once all these were above board, the investment was approved and the infrastructure capitalization occurred.

Jackline Okeyo presents her view concerning the above stated and says, unfortunately the guys who will have to make the most effort at this stage will be the green technology experts; developers need to see the prototypes and see that these systems have been tried and tested within a South African context, and that they are working efficiently in malls.

> "We want to see things that are real, that can be applied in the South African context; tired of these imports", (Okeyo, 2015).

> **Question 2:** In your opinion, do you think energy efficiency strategies are adequately dealing with the demand GAP for electricity?

Songo Didiza responded to this by affirming that the South African government was doing its' bit by introducing several policies i.e. National Energy Efficiency Strategy, and incentives such as the Industrial Energy Efficiency Programme, Private Sector Energy Efficiency programs, and several other tax related incentives, 12L, 12B, in order to reduce the demand and consumption of electricity. She emphasized that, most of these policies were introduced as a means of stimulating a national response to the energy supply challenge, and that society and business were urged to react, to fully realize the full outcomes of these policies. In her opinion, the more critical of the issues would be that, to-date we have had the state owned electricity generation company Eskom, overseeing a national energy demand side management programme (DSM), whereas their core focus should be building power stations and securing supply. Therefore it can be deduced that for Ms. Didiza, the energy efficiency strategies play a role, but still require public and private buy-in for them to truly reach their envisioned potential.

Mabuse Moja presents the idea that there were two camps on this issue from a listed investors perspective: the first camp have taken the stance that it is not their problem and that the tenant must pay, and the most they would do is change the lights and attack the low hanging fruits; while the second camp would take initiatives to assist tenants, almost bridging property development and asset management, as they would look at the income sustainability of making an asset last longer and reduce tenant Opex in the medium to long-run.

Werner Van Antwerpen states that energy efficiency has its' place in a specific property portfolio, but if you are thinking of developing or redeveloping a property and need extra electricity, then energy efficiency will not suffice. In order to understand and put into context the difference between what has been happening (load-shedding) and energy efficiency strategies, Mr. van Antwerpen describes it as follows: demand-side management is where the available electricity on the grid is spread to all who need it, while initiatives such as the switching off of non-essential appliances is run in order to control the demand generated during that peak loading period. Energy efficiency is different in that one is taking demand off the grid permanently.

CURRENT INTERVENTIONS

> In a typical retail mall set-up, air-con is the top energy consumer, then comes lighting, then all the other electric appliances / services (Friedland, 2015)

Matthew Friedland states that, if the problem of the air-con cannot be solved or tackled, then nothing truly will reduce the energy usage issue within retail malls. This would mean that the building would need to be air tight and preserve a constant temperature throughout the day as well as in the evening. Mabuse Moja backs Matthew on that point, and states that what is happening currently in the malls is that, the building manager is regulating the HVAC system by cutting it off at certain intervals in the day, and turning it on at others; this is mainly for purging the building in the mornings, which makes the circulation cold so as to last for some time before needing to pump the system up again to ventilate the spaces in accordance or in response to foot-traffic volume peaks.

The conundrum that faces current mall design though is that, natural lighting is "expensive", and the running of air-con is almost a necessity in enclosed malls; it is easier to deal with the air-con / HVAC, than it is the effects of natural lighting, i.e. expense of translucent materials to create diffused light aiding in the heat-gain problem, direct sun-light, etc.

> In retail, it is cheaper to have less glass and spend the money on artificial lighting, as this would result in the air-con working less (Friedland, 2015).

Mr. Friedland concluded by saying that he did not think the energy efficiency strategies were adequately dealing with the demand for electricity on an active scale. Ms. Mutshekwa agreed

with the sentiments above and stated that, the sustainability strategies were helping somewhat particularly in the short-term, but were not addressing the bigger problem, that being securing electricity supply. Ikageng Kekana stated that, South Africa is still in a "let us investigate phase" rather than an implementation phase:

> While we are busy doing this R&D (Research and development), the gap continues to increase, and by the time we begin implementing anything, the gap might be too big by then (Kekana, 2015)

Matthew Friedland and Ian Curry present a common view which will be further elaborated upon in the conclusion, the view states that:

In terms of sensible power generation technological planning, the goal / idea would be small modular units that could be deployed near to the source, to reduce transmission losses and minimize grid costs. These would ensure that the sustainability strategies evolve into electricity generation strategies which will in-fact sustainably grow the generating capacity within the country and end up sustaining the country's economic growth prospects / goals. Through this way of thinking, this thesis proves relevance with the proposal of micro-grid decentralization.

ENERGY EFFICIENCY FEASIBILITY

The issue is that every investor is looking at the payback period as well as a return; the listed sector investors are looking at approximately a five (5) year payback period for retrofits, and a ten (10) to twelve (12) year payback period on new developments that incorporate "green" technology (Moja, 2015). From a market analysts' perspective, within South Africa the trend illustrates that corporates do not stay in a building past 10 years, therefore the payback of the invested Capex of any sustainable intervention implemented throughout the building / s, needs to make sense within the 10 year period. Another key thing about the listed sector is the dividends that need to be paid out to investors in order to keep them happy and retain their money; this is in turn a double-edge-sword for development funds as it then comes down to immediate vs. future returns for investors. Therefore the strategies are not enough, and the Rands and cents illustrate that investors respond quicker to the bottom line over and above what is socially correct and acceptable (Moja, 2015).

The grey area of the answer is expressed best by Mveleli Nqwazi by stating, yes and no as a final answer:

> Yes, in the short-term the energy efficiency strategies work because no one is in the business of losing money, and these reduce if not at least slow down the Opex increments to a controllable pace. And no, because the alternatives might cost ten times more than the conventional generation, and would add value in the long-run; but what typically happens in shopping centers' is that the asset is offloaded to another entity or buyer every 5 to 10 years, meaning that investors might not realize their return by the time the next sale changes hands; hence investing in the "green technology" could pose problems in the investors cycle of portfolio management (Nqwazi, 2015).

All of these factors need to be considered, namely: project feasibility, ROI (return on investment), dividend payouts, OCC (opportunity cost of capital), tenant risk, etc., and create a very difficult space for maneuverability when it comes to new idea implementation, let alone introduction into the South African market place. But in every problem there comes a solution, and this thesis is a step towards one.

> **Question 3:** In your opinion, is the current stock of retail buildings reactive or proactive when it comes to energy self-sufficiency; and what could the possible causes for this be?

Ms. Didiza responds to this by stating that, it is easier for new buildings to be more proactive to energy self-sufficiency, as they are bound by current electricity supply constraints as well as legislation (SANS 10400 XA and SANS 204) when compared to existing buildings, therefore I would state reactive for now. Ikageng Kekana reports that, looking at the current / latest big 5 developments that have taken place recently namely: Mall of Africa in Modderfontein, Mall of the North in Polokwane, Bay West in Port Elizabeth, Newtown Junxion in Johannesburg, Forrest Hill in Centurion, and BT Ngebs City Mall in Mthatha; alternative energy solutions equate to zero, fundamentally illustrating a reactive stance / approach to retail self-sufficiency.

> Was sustainable energy considered in any of these developments? 'Never'; was it part of discussions at fund raising or feasibility stages? 'Not at all'; therefore this demonstrates that new developments have actually been mute on this issue of electricity, they instead are more concerned with the electricity supply Eskom can supply to the development, (Kekana, 2015), the tried and tested method.

Ian Curry adds to this point by also concurring that:

> "Current retail stock in South Africa is nowhere near self-sufficiency status" (Curry, 2015).

As a consensus the interviewees agreed that the current stock of retail was reactive.

SUSTAINABLE INTERVENTIONS

Werner van Antwerpen discusses that solar power is not all that is evaluated when it comes to a holistic energy design for an existing development: there are aspects surrounding heat recovery, heat loss, Capex improvements that would reduce HVAC cooling / heating loads, the utilization of wet-waste as well as decomposable waste generated in retail malls in order to generate methane gas, etc. With this current dialogue, the existing stock of retail should in time join the party and begin a self-sufficiency trajectory that will in time align itself with new builds that share the same vision (van Antwerpen, 2015).

Through this way of thinking, consultants have an opportunity to change the business model, as researches like these would open up a dialogue with Developers from a point of understanding rather than that of mis-education.

> "Not to be Green, or socially correct, but rather to be at the forefront of the game and be economically effective over the lifespan of the facility; that is what the Developers are not looking at", (Curry, 2015)

SECOND THEME: DEVELOPMENT GOALS AND FORECASTS FOR LISTED RETAIL PROPERTY DEVELOPMENTS WITHIN GAUTENG FOR THE NEXT FIVE TO TEN YEARS

The objective within this section was to ascertain from the property development sector where their perceptions lay, both currently and in the future, with regard to energy efficiency strategies, property self-sufficiency, the plugging of real estate back into the national electricity grid, the value or importance of green buildings / green retail developments, and their view on embedded electricity generation within future developments.

- **THEME RESPONSE SUMMATION PRIOR DELVING INTO DETAILED RESPONSES**

Majority of the interviewees reported that, with retail retrofits / retail brownfield developments, the scope was very limited with regards to up specifying / upgrading the building to be more energy efficient, and to eventually reach a level where it could generate electricity; as there was very little that could be done to the actual physical asset while still keeping the projected cash-flows and returns achievable. The true scope was identified as being in new developments, for in those, the capex could be geared towards asset self-sufficiency, and in that lay more perceived value by all stakeholders involved. Therefore when linking returns, to corporate image, to sustainability, and to the idea of minimizing the impact by the built environment on the earth, then the opportunity presents itself to help all stakeholders achieve their objectives.

It was found that most property development companies and property management funds, had very little to no strategies currently underway for embedded energy / electricity generation within retail developments, and were instead feeling their way through the transition / progression towards a more sustainable and efficient electricity usage. The general sentiment was that once the sustainability achievables become mandatory, then the transition will take full flight, until then development can feel its way through this period.

There were one or two interviewees who were for building self-sufficient retail developments at the moment; they identified some of the drivers towards this being: the price point parity between embedded solar generation (self-sufficient) and municipal supply of electricity (grid connected) in South Africa having been met; as well as the current rate of market take-up. This meant that by installing renewable electricity generating infrastructure as well as embedded energy storage infrastructure, developments would hedge against future

inflationary electricity price hikes / tariffs, while still remaining within the same price bracket as when using conventional energy supply methods.

With regards to the importance of "green buildings" in the listed property sector, it was found that from a market analysts' perspective, it was not seen as having high importance in terms of retail, while for offices and industrial the interest had peaked. This could be attributed to the tenancy: it was mentioned that it was easier to discuss and resolve issues with a single tenant rather than many; a retail development could exceed a tenancy of over seventy-five tenants who would all need to be negotiated with, and this proved too cumbersome to achieve.

Lastly, there was an identified strategy that could fit in well with the South African listed property sector, green rating status, as well as the financing system; this was identified as the NAB Metric tool. When incorporated into the property development system, the green building tool from GBCSA (Green building council of South Africa) and SAPOAs' (South African Property Owners Association) grading, could then be looked at as one holistic element, where depending on the building rating (P - D grade), building age, as well as green star rating, a development company / income fund could charge within a range of benchmarked prices for their leases, which in turn would keep buildings evolving / constantly up to date, and would stimulate creativity and dynamism in the property development sector of South Africa. In so doing, "going green" would be justified in expenditure by fund / property development companies, as well as be perceived by investors as a value add to the portfolio of investable assets.

- **DETAILED & INDIVIDUAL RESPONSES**

Question 1: As someone who represents or is affiliated with a commercial real estate company, what strategies are being put in place for current retail stock energy efficiency, and future retail development self-sufficiency?

Helen Mutshekwa explains that with retrofits the scope is very limited, as there is only so much one can do and still keep the entire deal feasible. She goes on further to say, the scope is really on new development, as in that lies more perceived value.

From the interviews, it could be deduced that all the interviewees saw the potential growth of the feasibility of self-sufficient commercial real estate in new / green field developments, as in these the necessary design principles could be carried out from the beginning, maximizing on value engineering (catering for all necessary eventualities from project design stage, and assisting in cutting costs).

Werner van Antwerpen commented that his organization was currently focused on lighting retrofits, but did concede that on the retail side, they needed to do more to reduce Opex, but that the focus was still on sustainability rather than self-sufficiency. Mveleli Nqwazi commented as well by stating that his organization had no strategies in place, as they only strove for the bottom line, namely monetary returns / maximizing investor ROI. Ikageng Kekana stated that within the bank there were no strategies in place for building efficiency requirements for their clients or even future self-sufficiency instruments for investment valuation, but that there was a division that was formulated in-house to look into alternative energies and ways of doing future property deals.

This would illustrate that from a Developers perspective, nothing was currently being done to meet the challenge of retail property self-sufficiency, let alone listed retail developments, and that not much was set to change either, unless these issues (property efficiency and self-sufficiency) are legislated and are necessary for building approval to meet construction approval.

Ian Curry responded from an IPP / RPP's perspective, and identified real estate as the next real growth in the global movement of energy efficiency and self-sufficiency, particularly in the renewables sector; the ability to be able to tap into the existing electricity grid / national infrastructure would be hugely beneficial for upgrading transmission throughout the country. He carried on to state that, the big utility type projects were exciting, where loads of megawatts were plugged into the grid; but where the market will see real growth, is in the integration and aggressive movement into property development renewable energy infrastructure generation.

Future retail development self-sufficiency:

> "It now makes economic sense, because now from day one you are paying the same or slightly less than what you would have been paying normally; then from year 2, 3, and years 4, you are going to be paying less, and less, and less, relative to the price of electricity at the time. But it is quite a big capital outlay, so in a new development the outlay is relatively small", (Curry, 2015).

Therefore installing renewable electricity generating infrastructure as well as embedded energy storage capabilities, would hedge against future inflationary electricity price hikes / tariffs.

Question 2: What is the importance and regard of green building in the listed property sector?

Songo Didiza responds to this by stating that, the listed property market appears to be the market leader regarding green building development in South Africa. All the major income funds are taking a cautious but optimistic approach to investing, but are aware of the prospects or added value to come from these assets. Werner van Antwerpen concurred with Ms. Didiza and added that, green buildings are very important to the listed property sector as they look at nine (9) different categories of sustainability, not only water and electricity. He further explains that by ending up with a certification, it allows one to illustrate the value and quality of their portfolio over and above the bricks and mortar, while increasing building marketability, outperforming other conventional buildings within the same asset class classification (P-grade, A-grade, etc.), and are able to increase productivity for the tenant, even though this is difficult to quantify.

Mabuse Moja sums up the sentiment of the developers from a market analysts' point of view by stating that: for now it is not a necessity; it is definitely becoming something that is becoming more important. In all the meetings he has attended of late, the agenda would include, waste consumption, electricity, rates & taxes, and now at the forefront, sustainability. He states that people are concerned with decreasing Opex costs and the mitigation of the effects of the burden to tenants. Helen Mutshekwa agreed with the above statement, and adds on further that legislation would help in this regard, as for now, green buildings are a nice to have but not a must.

FEASIBILITY

Matthew Friedland points out that, offices seem to have more of an immediate and tangible return to investors as opposed to retail, as tenants can experience and visualize their savings on a day to day basis. He goes on further to mention that, going green for retail seems to be contributing towards the greater good of humanity without tangible and immediate results that are expressed through returns on investment for the investors. Mr. Nqwazi agrees with the sentiments expressed above, in that only office and industrial spaces are valued in terms of the current building efficiency and sustainability listed property market, and retail takes a far back seat.

Mabuse Moja discusses a system being utilized oversees which could be incorporated within South Africa's context to enrich this dialogue:

> In Australia the NAB Metric, similar to the Green building tool in South Africa, is utilized in order to merge building ratings and rentals, allowing them to work as one holistic system rather than two opposing systems which is currently the case in South Africa. They have pegged the SAPOA grading we use in South Africa, with their green star rating, meaning that depending on the building rating (P - D grade), building age, as well as green star rating; a development company / income fund could charge within a range of prices for their leases. This in turn keeps buildings evolving, and legislates developers to develop with a certain goal in mind, directly affecting cash-flows, and building / development feasibility (Moja, 2015).

Through incorporating a system such as the one discussed above, the green building tool and SAPOA grading could then be looked at as one holistic element, enticing investors to drive the sustainability concept all by choosing which fund to invest in that would firstly bring them the highest return on investment, and secondly, which fund has the greenest portfolio.

Question 3: Should electricity generating infrastructure be considered when conceptualizing real estate developments?

Songo Didiza commented on this by saying, the new building legislation (SANS 204) already compelled the built environment sector to look towards conserving electricity at the design level. The next iteration of the legislation (which is currently under review) will place stricter requirements on electricity generation infrastructure - also now with the prices of embedded

generation / self-sufficient electricity supply options being lucrative - policy makers are starting to be responsive to this, and are following suit by introducing small scale embedded generation (SSEG) guidelines for municipalities. Cape Town municipality already has a feed in tariff for SSEG, and it is anticipated other municipalities will soon be following suit on a country wide scale.

Ikageng Kekana emphasizes that it should be and that it should go without question:

> Imagine if mining companies / bulk users of electricity could get a sustainable energy supply, while those that do not want to be taxed or penalized for remaining on the Eskom grid as their sole electricity provider, transform to a more renewable energy generation route; houses could be subsidized by the mines in those communities to get off the grid, while commercial companies that would want sole access to grid supplied electricity would benefit from it. This would pick up production, distribution, and inflows of GDP (Kekana, 2015).

Edgar Semenya adds that by conceptualizing electricity generation from inception, it would make the project more feasible and would save Capex through value engineering by the consultants from the get-go. Werner van Antwerpen agreed with this statement and noted that we are already beginning to see the trend coming to play with the latest industrial developments in the market, as well as Tri-generation power-plants in current offices. The unanimous answer from all interviewees was that, it should be considered from inception.

THIRD THEME: FEASIBILITY AND SUSTAINABILITY OF RETAIL PROPERTY DEVELOPMENTS INTEGRATING INTO THE CURRENT ELECTRICITY GRID

The objective within this section was to interrogate what industry professionals understood and knew about alternative energy generation feasibility within the built environment, especially in retail; and test whether the idea of becoming electricity producers had ever crossed their minds.

- **THEME RESPONSE SUMMATION PRIOR DELVING INTO DETAILED RESPONSES**

It was generally accepted by the interviewees that South African retail development research into alternative energies / electricity supply, had not done enough to understand the new playing field, and had instead focused mainly on office and industrial property types, while overlooking retail as well as residential to a certain extent. Another generally accepted assumption was that it seemed like there were more costs than there were benefits in developing or incorporating alternative energies into new and even existing retail developments. The difference with this research was that, it specifically focused not only on the asset, but also what the asset could contribute back to society, while opening a niche profit making margin that is justifiable to investors, and linking itself to the sustainability movement. As previously discussed in the literature review, the key aims for regulators in the past and currently were energy sector efficiency, as well as an introduction to energy market competitiveness (Sioshansi, 2006); therefore newer solutions that could contribute to this movement would be a necessity as our contribution to energy sustainability in the future.

Focusing directly on the problem, an interviewee identified that it all came down to irrecoverable Capex within the stipulated / normal 7 - 10 year payback period for commercial property investments (opportunity cost of capital); this made the retail space an unattractive environment for yield driven property investors, especially if the returns period would now be increased due to larger upfront expenditure. There is a point to ponder here, as the market economics would still drive the possible lease price that the market is willing to pay for lettable area, no matter how the initial capex will need to be recovered; therefore market buy-in would be vital, as tenants would need to accept higher leasing prices, or the developer would need to reduce their profit margin, or shareholders would just need to expect extended ROI (return of investment) periods to make future listed retail development deals work.

Referring back to the literature, as Agrawal (2012) stated, renewable energy financing had been seen in the past to be of high risk with regards to industry faith in new technologies, as well as future cash flows. Investors considered amongst other things:

- Performance risks during the developments life-span (technology guarantees)
- Market risk (the price at which power is purchased)
- Regulatory risks (power-generation cap by energy regulators)
- And whether the formation of an SPV (special purpose vehicle) could be created in order to reduce financial risk contamination with future investments.

All of these factors were major considerations when sourcing investment from the capital markets in the form of debt, and needed to be evaluated in terms of yield returns to the investors in the long-run.

INVESTMENT RESPONSE

In order to face these challenges mentioned above, a different interviewee proposed an amalgamated and progressive solution that was theorized as follows:

There were innovative companies that were looking at the capex and recoverables issues, who were creating funding mechanisms to install electricity generating infrastructure at no initial / additional cost to the owner; these companies would link / plug their installations into the national infrastructure grid, either under their own IPP registration, or under the embedded code allocated by NERSA, and then would manage the infrastructure thereafter. The developer could seize this opportunity to charge the company owning the infrastructure rent for the now usable area either on the roof or elsewhere, the company could provide electricity directly to the retail establishment and sell-off excess electricity back to the national infrastructure grid, and remove the loading / electricity permanently off the grid.

Drawing from the research again, Eichholtz *et al*. (2013) found that their research suggested that property investors attributed a lower risk premium for more energy-efficient and sustainable commercial space; further noting that rated buildings provided a hedge against higher energy prices, and shifting preferences of both tenants and investors with respect to environmental issues.

The key then was to gauge whether a retail centre could develop electricity in excess and plug back into the grid; the answers were split 50/50 where some interviewees agreed it could be done, while others cited the fact that a retail centre utilized all the power it would generate and for that reason would not plug anything back to the grid.

For now I am inclined to lean towards the latter, but in due course once other forms of energy generation are introduced into the property space i.e. bio-mass reactors that can be fired up to power tri-generators; then the scales will tip in favour of the grid integration plug-in.

- **DETAILED & INDIVIDUAL RESPONSES**

Question 1: What is your understanding of the perceived cost vs. benefit relationship, of building green retail developments (the capital outlay, yield margins, and value)?

Jackline Okeyo comments that her organization, has not sat down and done any detailed analysis on sustainability, costs, etc.; but can comment that the general consensus is that South African retail research into alternative energies / electricity supply, has not done enough to understand the new playing field, and that focus has mainly been in the office and industrial arena. Ikageng Kekana agrees with Jackline, and adds that: currently it seems like there are more costs than there are benefits in developing or incorporating alternative energies within new and even existing retail developments.

The current problem that the commercial market is faced with is that, Green buildings are competing in the same leagues / space as P-grade or at times A-grade properties, where a green building is asking higher rentals, which subsequently places it out of the market in terms of affordability. Unless there is a legislated method to prove which bandwidth each building should be benchmarking their rentals, there will be no clear or direct way forward.

Matthew Friedland states that, in a nut-shell, it all comes down to irrecoverable Capex within a stipulated 7 - 10 year period, like with offices or rather the opportunity cost of capital; this makes the retail space an unattractive environment for yield driven investors. Incentives would be the only way to close the gap; maybe the closer the solution gets to solving recurring Opex issues on a monthly basis, the more feasible it would be in the short run; rendering it more appealing to investors. Edgar Semenya concurs with Matthew Friedland and states that, investors would think about the situation as follows; if it were going to take one to five years

longer than “normal” to realize their initial outlay, then they would be less likely to invest; it therefore must always be kept in mind: of cost to whom, and of benefit to whom (Semenya, 2015).

Focusing on the fundamentals: the value of commercial property is based on its’ income producing capability, and income is dependent on tenants; therefore reducing their load by providing energy security would allow them to trade and fulfill their lease obligations, increasing the value of the asset not just the bricks and mortar. This could be used as a defense for growth driven investments, and to a certain extent yield driven too.

Ian Curry discusses how to make everything feasible by developing creative and innovative funding structures for property development:

There are companies looking at the whole Capex and recoverable issue, who are finding innovative funding mechanisms to install the electricity generating infrastructure at no initial cost to the owner, and then manage the infrastructure thereafter on their behalf. The analogy he used was that, when a tenant rents square meterage in any commercial building, landlords provide cleaning services, security services, etc.; why do they not just provide electricity as well and make a margin on it? (Curry, 2015)

The question was then put to him that, this would be an interesting thought, but would NERSA allow such practices where developers could register as IPP’s? The answer to this, was that Developers did not need to register as IPP’s for the mere reason that their generation would not exceed 1.2 MW onsite, and that in essence there would only be two feeds entering into the building: one from City power and the other from the photovoltaic panels (if that was the only alternative energy option utilized). If the generation was to exceed the stipulated electricity benchmark for an individual building, then the answer would be to partner with a utility company that is already registered as an IPP, and that would sort the problem of connection to power point into the existing grid from a legislative perspective.

It is clear then that the issues are many and the terminology thrown around touches on matters of investment, value, perceived value, value to whom, as well as grid connectivity. It would evoke a study that would tackle these issues and pin-point scientifically where the costs

and benefits would lie; for this exploratory research, the understanding of different industry mindsets was more important and the way forward from a point of knowledge.

Question 2: Do listed property companies have an investment appetite for green retail developments, why or why not?

Mr. Nqwazi responds by stating that listed companies in his opinion and experience do not have an interest / incentive as yet to invest in green retail developments, because their primary goals are looking at short term profits, and not looking at solving the countries problems. He goes on to state that, "shareholders control the bottom line, and steer certain decisions"; if tenants drive it back-up to Developers, Developers will drive it back up to the investors as a justification for the necessary expenditure (Nqwazi, 2015). Mr. van Antwerpen commented that, retail was probably the least progressive from a green building certification point of view, as compared to Industrial, and office developments. The possible reason for that could be that, in a retail mall there are common areas where everybody has to contribute towards, with the bulk of the electricity consumption being used up by your tenants; this makes it difficult to explain to the franchise stores which lights to use in their space in order to conform to a mall standard, as this may mess with the light levels; and blurs the lines between the landlords responsibilities versus the tenants responsibilities.

Tenants do not benefit from ownership rights, while the landlord would like to save costs and secure energy; this is difficult to achieve at the best of times and would need all parties to come to the table, prior even looking at it from an investor's perspective.

Ms. Mutshekwa agrees with Mr. van Antwerpen and states that, the tenant market needs to come to the party when it comes to negotiations to promote sustainability & self-sufficiency; it is only through this way of action that Asset Managers, and shareholders will even consider the investment.

Going back to Mr. Van Antwerpen's point, a benchmarking tool is missing for the retail sector, in terms of common area benchmarking; there is an international tool available to calculate it, but it needs to be implemented in RSA. Only then will it not be a case of tenants forcing the hand of developers, but rather developers being able to approach tenants regarding their performance for common areas and encourage the tenants to do more within their spaces.

All these terms and conditions would need to be worked through in order to come up with one holistic solution or at least a plan moving forward.

Question 3: If houses can plug electricity back into the national infrastructure grid through a procedure of reverse metering, do you foresee retail developments doing the same in time?

Songo Didiza commented in the following:

> The idea of reverse metering is currently being piloted by the Municipality of EThekwini, and Cape Town local government. This is where individual developments (mostly residential currently) can plug back into the national infrastructure grid, and feed the excess electricity generated back into it (Didiza, 2015).

Imagine a scenario where, instead of the individual property or development drawing electricity solely from the grid, the asset can generate its' own electricity (self-sufficiency) and feed the excess electricity generated back into the grid. The meter (initially solely used to assess the developments electricity usage), can now serve a secondary purpose of being "smart" (able to communicate to a main-frame whether it has excess electricity or needs to pull from the grid; in so doing allowing for the national regulator NERSA, to regulate, and Eskom to direct "traffic" / distribution thereof. This would equate to an energy transfer rather than a purchase, and would tackle the issue of electricity privatization.

Werner van Antwerpen explains that, the unique thing about a retail mall is that the demand of the centre is greater than what the roof space potential generation capability is (if you considering PV); the peak of a retail mall usually coincides with the peak generation of a solar installation. Therefore there would be no excess energy / electricity to plug back in. So at this stage he did not foresee retail developments contributing back to the grid, as they consume all they would generate (van Antwerpen, 2015). Matthew Friedland concurs with Mr. Van Antwerpen, in that he also does not believe it is possible, and certainly not only with PV. Mr. Friedland suggests that when dealing with such issues, the core planning to be interrogated would be the urban design and cities design; if you do not have dense cities, the distances between the locations / points of supply, generate great electricity losses (Friedland, 2015).

Ikageng Kekana shared the sentiments of the past opinions stating that, it would be difficult for retail centres to generate excess electricity, because the demand for electricity was from

the morning till about 21:00 pm in the evening; therefore by the time the centre switches-off, there are no gains that could be made, meaning the retail development could only generate enough power to feed itself, and its' own consumption (Kekana, 2015). Where Mr. Kekana did enlighten was the suggestion that other alternative energy solutions could be considered, as they could be integrated with solar PV to offset the energy deficit; the energy solutions such as tri-generation and bio-mass / methane gas, that could also be derived from the developments and become energy contributors' onsite, could then be explored and supplement the PV's (Kekana, 2015).

Through a solution such as this one, this could then generate the energy needed that could burn through the night and feed into the network off-peak, allowing a bit of saved power to be utilized for the actual mall purging in the evenings, etc.

Ian Curry stated that typically retail operates 7 days a week, 365 days a year, with the bulk of their load being during the day, with 99% of the time, the development consuming what it could generate. Clearwater mall being a classic example of that, as it consumes everything it produces and contributes very little to the grid. Theoretically it could, if it looked at alternative interventions, but as for a further investment in a PV installation, their physical footprint will be a stifling block. Therefore in mixed use developments, he definitely believes it is possible, but a pure retail development, the answer would be no (Curry, 2015).

The views from the rest of the interviewees were all in agreement with this intervention being a possibility:

Songo Didiza mentioned that, this was already being done; in the Western Cape, there were nine other municipalities that had draft policies in place to allow building plug-in, and there was a broader scope to introduce more such interventions / projects once the policy had been formally signed-off (Didiza, 2015). In Mabuse Moja's opinion, it would probably be the next step of progression once the tenants come on board; but concluded that there needs to be a synergy between legislation, SAPOA, and GBCSA to make the entire system work (Moja, 2015). Jackline Okeyo believes it is a possibility, but the government still needs to be able to regulate the pricing of electricity, and not have the poorest of the poor buying electricity from private companies; hence Eskom would still has a key role to play. A suggestion would be for

the poorest of the poor and Industrial corporations to still get fed from the grid, while those who could afford over a certain period of time, join the smart-grid (Okeyo, 2015).

To conclude the opinions of the believers, Edgar Semenya suggests that, “if I do not feel the Capex deduction, and will benefit profitably, then I’m interested”; meaning that he would consider another party installing the infrastructure, paying rent on the roof space, and making their profit from feeding both his developments as well as any excess being plugged back into the national grid (Semenya, 2015). Future researches could look at collaborative ways of adding servitudes on development title-deeds for the IPP’s.

FORTH THEME: POSSIBLE NICHE MARKETS AND OPPORTUNITIES ARISING FROM THE POSSIBILITY OF ELECTRICITY PRODUCTION DECENTRALIZATION

Within this section questions pertaining to electricity decentralization, micro-grids, and embedded energy production for developments, are asked and probed. The objective is to begin picking the minds of the Developers to see if they can see the potential in this infrastructure investment.

- **THEME RESPONSE SUMMATION PRIOR DELVING INTO DETAILED RESPONSES**

The majority response from the interviewees was that, they could see the idea working, where the centralized electricity generation system was substituted by individual self-sufficient buildings. These assets could then generate electricity in excess and plug it back into the existing national grid, creating a product (electricity) that would be reverse metered into the grid without a cash transfer, but rather a trade in a commodity.

Concerns were raised by the interviewees though, mainly regarding the connection into the grid as well as the monopolization of electricity as a commodity once produced. In answering this, Eskom would control the traffic flow of electricity, while NERSA legislated the reverse metering connection, allowing the electricity market to still be in the control of the state parastatal without the need to privatize. This would allow the private sector to take the lead in the generation of electricity and the main suppliers to Eskom. One of the benefits of energy regulation without the pressure of generating electricity is that, the state would then still be able to subsidize those who need electricity by not allowing prices from the private sector to sky-rocket.

Referring back to the literature, it was identified within the NDP 2030 (National Development Plan) that, the country would need an additional 29 000MW of electricity by 2030. This opens up an opportunity for the private sector to step in, and not only with a 30% contribution, but in essence the balance or deficit necessary capacity of 40 000MW by the year 2030. Part of the objectives in the NDP were that at least 20 000 MW of electricity generation was to come from renewable resources, a move towards a less carbon-intensive electricity production process, and accelerate procurement of independent power producers.

- **DETAILED & INDIVIDUAL RESPONSES**

Question 1: Do you think energy generation decentralization, could be a possible solution, with multiple power sources plugging into the national electricity grid?

The idea of energy decentralization is one where society breaks away from the centralized production system which got the nation into this current situation it is in, and heads towards a direction where individual developments can plug into the national electricity grid and benefit from incentives such as the feed-in tariffs, as well as reverse metering; all for contributing back renewable and sustainable electricity.

Mr. Friedland responded in saying, he could absolutely see it happening, but that the idea would have to be driven by government; it would have to be done intensively and phased over time (Friedland, 2015). Ms. Didiza agreed with the above statement and continued by stating that it was a possibility, but would be dependent on the policy framework and to some extent political will. It should be noted that alternative energy options present financial and sustainability risks to existing conventional energy supply options i.e. coal, diesel, and now impending nuclear; “it would be an interesting piece of legislature to read once approved” (Didiza, 2015).

Mabuse Moja states that the problem is going to be, how you standardize the power distribution, as well as not allowing for monopolies to form through the commoditization of electricity; and given our history in this country, are we really ready to allow for this decentralization as yet? Frameworks would have to be created and heavily regulated, to stop monopolies (Moja, 2015). He continues to say that a pricing model should be worked-out that will allow for social, capital, and political forces to all benefit if that is even possible (Moja, 2015). Mr. van Antwerpen agreed, and further added that we all needed to insure that the production plants were legitimate, and were certified (van Antwerpen, 2015).

Interpolating from the above comments, the point always to remain cognizant of is that, electricity is a right for all, and how do we then control who gets free electricity and who pays for it? This will need to be well thought-out in order to insure transparency, a lack of corruption, and a speedy efficient system that would elevate the country into first-world status.

SUSTAINABLE INTERVENTIONS

Ms. Didiza reported that, on the renewable energy front, the country had already seen over 82 000 PV (photovoltaic) installations at various scales and in differing economic sectors (industry, residential, etc.). These installations translated into 83 MW of power to date (December 2015), as compared to just 19 MW earlier that same year; illustrating an over 330% market growth in a short space of time (Didiza, 2015).

> It is not a possible solution, it is reality, it is happening; the state parastatal needs competition. A national utilities' fundamental role, is to deliver electricity to the consumer (be it households, business, etc.), and to enable economic growth. In the past the only way to generate cost effective electricity was to generate bulk electricity, with long time lines, and returns. The cost of generation has come down now, where you do not need the massive utility scale; therefore the utility (Eskom) should exist / progress towards running distribution and transmission, and leaving generation to society / private sector, (Curry, 2015).

LOOKING INTO MICRO-GRIDS:

Mr. van Antwerpen presents a thought that should be kept in mind for the development of the "green building movement":

> Like with the rest of the African countries leap-frogging landline telephones with cellphone technology, the rest of Africa / or less developed parts of Africa might leap-frog central electricity generation plants, due to capital constraints, and actually go to decentralized systems directly (van Antwerpen, 2015).

Mveleli Nqwazi stated that for the intervention to gain traction / to be significant it would have to be in a larger scale in terms of individual buildings integration almost on a utility scale. He describes a scenario where he sees the largest impact for integration coming from the residential market, which in turn could have an immediate impact on retail:

> Imagine if a developer like Balwin developed an 800 unit development, which could plug back into the electricity grid; imagine if all those houses could generate electricity and subsidize the nearby retail development; that could be used as a prototype, and executed throughout the country, (Nqwazi, 2015).

Jackline Okeyo shared the same sentiments and stated that, this strategy would then encourage consumers to be a bit more conscience of their electricity usage and generation, because if they could plug back into the grid and make a saving from it, then they would do it (Okeyo, 2015).

> "It's definitely a possibility; the question is just in how it will be administered", (Okeyo, 2015).

Ikageng Kekana stated that the intervention was possible, but there was something lacking within the formula which he identified as education:

> The market is not fully aware of these interventions, and with that being said, the costs are scaring everyone for now. Something always to be kept in mind though is that: what comes with innovation is the stress that comes with it, when the technology does not work, (Kekana, 2015).

Therefore the exploration and deliberation has to begin now, as like with pharmaceuticals through drug-testing, pilots must be tried in South Africa as soon as possible so as to tailor the perfect fit for our economy.

FIFTH THEME: CONCEPT TRANSFERABILITY OF RETAIL REAL ESTATE SELF-SUFFICIENCY WITHIN SOUTH AFRICA

If the concept was to be implemented in South Africa, where large free-standing developments could generate electricity at a sub-utility scale and plug excess electricity back into the grid, would it then be easily transferrable as a pilot / idea to the rest of Africa? South Africa is already seen as the gateway to the rest of Africa, therefore within this section, this is what is being interrogated, and the scope is further extended to the rest of the world.

- **THEME RESPONSE SUMMATION PRIOR DELVING INTO DETAILED RESPONSES**

The idea of micro-grids / sub-utility scale electricity generation and smart-grids, was one where the components that made up the whole, were considered more important than the one existing core generator (state parastatal Eskom). In so saying, this was a vision that was shared by all the interviewees, and even prompted a comment from one, who stated that the rest of Africa could see themselves leap-frogging South Africa in terms of centralized electricity generation, and just go directly to decentralized, self-sufficient properties, without wasting investment capital into conventional / centralized large scale utility electricity production. That alone illustrated progress and the way envisioned towards the future.

Referring back to the literature yet again, the South African electricity market had been found to have gone through the act of restructuring, the act of market liberalization, corporatization, while having never been fully deregulated. This meant that the South African electricity market had evolved with time and in essence had kept abreast with global industry standards; only leaving the next form of evolution to push the industry into the future.

- **DETAILED & INDIVIDUAL RESPONSES**

Question 1: Do you believe that the South African market is ready for electricity generating retail developments?

Mabuse Moja stated that it would be quite an interesting concept in the South African context, and a simple one to implement. Power storage has become more and more feasible and accessible; with the only obstacle standing in the way being the uncertainty of legislation from Nersa (Moja, 2015). One always needs to keep in mind that:

> "South African property development has always been extractive, rather than sustainable", and for that reason the mindset has to change, (Moja, 2015).

Ian Curry discusses Eskom's current development strategy by stating that, currently the flow of power nationally, flows from Mpumalanga to Cape Town; what is envisioned in the plan, is a reverse of that flow from Cape Town to the hinterlands – directly driven by the new nuclear power station that is set to be built in the Western Cape – this would see the concentration of fossil fuel generating power plants in the mid and south west of the republic, and would sustain the current trend of renewable power plants / RPP establishments sprouting towards the west of the country, namely the Northern Cape. With all that being said - with the addition of utility scale renewable projects envisioned in the near future and 20 000MW going to be contributed to the national grid - there is no reason real estate cannot be part of the revolution (Curry, 2015).

The idea of micro-grids / sub-utility scale electricity generation smart-grids, is one where the components that make up the whole, are considered more important than the one core generator; implying that there would be a significant capital investment needed in order to get the current "grid" infrastructure to smart-grid status. This opens up the playing field where instead of retrofitting ailing infrastructure, the focus can now be on individual developments that would not load the "grid" further.

The comments of the rest of the interviewees were all positive, with Matthew Friedland stating that, once the retailers changed their mindsets regarding an increase of rentals to factor in development self-sufficiency, an understanding of liability (landlord vs. tenant rights), a proper feasibility relating to business returns (both for developers as well as retailers), as well as all legislation ironed-out, only then would the idea of concept transferability be tangible within the short to medium term (Friedland, 2015). Edgar Semenya agreed with the statement and cited the importance of clarity in terms of benefit to whom, of value to whom, and of cost to whom. Mveleli Nqwazi reiterated that, if commercial / corporate establishments could achieve their profitability goals, meet their investors' expectations, and the grid allowed for this proposed intervention, then he saw no reason why it could not work for retail (Nqwazi, Semenya, 2015).

5 CONCLUSION

Throughout the research, a number of findings and discoveries were unearthed, and the chosen methodology proved fruitful in terms of engaging with industry professionals on the subject matter at hand. At first the idea of defining and attempting to tackle the challenge of the energy / electricity crisis within South Africa let alone Gauteng, while tying it all back to the base subject of retail property development, seemed to be a daunting task; but once the research continued and became more defined, delineated, and focused, it was a challenge that had to be accepted and researched thoroughly in order to put the researchers mind at ease.

Throughout the history of South Africa, electricity has been of utmost importance to the economy, for both its' development, as well as its' sustainability. The electrification roll-outs in the formative years of democracy proved fruitful, and were necessary for the country in order to increase society's access to electricity, as well as to liberate the once restricted. It is debatable whether the current government and that of the time, allowed the situation of current energy / electricity demand to over exceed supply capability, or whether they had no choice but to prioritize other pressing matters that dealt with what affected people immediately, namely: a lack of housing, access to water and sanitation, redistribution of land, structural legislative barriers that needed to be dealt with in the past, etc.; but the situation currently sees poor planning from the state parastatal as well as government as a whole with regards to electricity security for the nation.

The Government has since then suffered year-on-year budgetary deficits, a slowdown in the economic growth of the country, as well as three Presidents whose cabinets all drove different agendas. This has seen the introduction and an ongoing problem of electricity supply volatility and as a subsequent result load-shedding, and an intense movement towards energy efficiency as well as self-sufficiency to those who could afford.

This research came about in order to find a way forward, that would involve retail property development, business, finance, a move away from the conventional electricity generation solution, as well as the limiting of damage to environment; all in order to find solutions that can be sustainable and innovative, that would begin engaging with majority of the above

mentioned subject matters in everyday design and construction of listed regional & super-regional retail property developments within Gauteng.

ASSUMPTIONS

The first assumption that was stated as part of this research was that the South African property development industry as well as the energy / electricity producing network, were ready for energy production decentralization within the Gauteng province. This has been supported by the research empirical findings, and is better understood now in terms of the concepts of decentralized electricity generation, progressive market sentiment, as well as property developments' next step of progression. Building plug-in and feed-in tariffs are currently being piloted in different municipalities within South Africa, and in no time, will form part of the norm in everyday property development conversation.

The second assumption was that future retail developments could become IPPs' / RPPs' that could plug back into the national grid through the idea of reverse metering. This was supported in the empirical findings noting that, for as long as the development electricity generation capacity did not exceed 1.2MW's, it could then plug into the grid only needing NERSAs' approval to do so and not needing to register as an IPP. There were other solutions offered where energy generating companies that were already registered as IPP's / RPP's could distribute electricity directly to the customers property, and plug into the grid without the customer / development needing to itself register as an IPP.

And the final assumption was that future listed retail property developments would be responsive to trends, opportunity, and tenant needs. This still is to be seen and can only be assessed in the future. Following this research and the ideas planted in the professionals that participated in this research, it can only be hoped that they will go out there with a new mind set and develop differently.

IN ANSWERING THE RESEARCH QUESTION

What are the current circumstances, transitional responses, and possible solutions to achieving energy self-sufficiency in listed regional and super-regional retail developments within Gauteng?

It can be concluded that an intervention such as this one, could work in the medium to long-run, but would face quite a few challenges through the teething phases of having the legislation drawn-up, changing mind-sets of developers, changing mind-sets of consultants, changing mind-sets of tenants, as well as changing governments' stance to the entire issue of electricity generation, transmission, as well as distribution. Some of the more acute challenges would be: grid connection approval (of which Nersa as the energy regulator, would need to devise a strategy that would remove Eskom from the electricity generation sphere, and into the smart-grid monitoring position / facilitation); IPP / RPP approval (a challenge that the department of energy would need to prioritize in order to allow for a seamless inclusion of the private sector into the renewable electricity business); the current developer sentiment that is hesitant to veer away from the tried and tested; as well as the intrinsic challenge faced by the industry, where electricity consumption of a regional & super-regional retail centre would almost be on par with the potential electricity that could be produced.

CURRENT ENERGY POLICY:

In order to look towards the future, we need to look to the past in order to be able to track energy policy and a national stance point. While reading the Concept Report: The South African energy landscape by Dirk de Vos, his opinion is that the official energy policy can be tracked back to the 1998 white paper; some of these points included: electricity supplier liberalization to consumers, increased competition from the private sector, and the choice to be in the hands of the customers when it came to choosing an electricity supplier (de Vos, 2015). Progress can clearly be seen towards these matters to-date, where one of the points being addressed in this research being the electricity supplier liberalization idea, and how to incorporate real estate into that.

The South African green economy / renewable energy market can be categorized into three (3) categories: embedded generation (commercial & industrial would be between 10kW – 1MW, while residential would be less than 10kW), utility scale renewable energy generation (Generation greater than five (5) MW), as well as distributed generation (again commercial & industrial being between 10kW – 1MW), (RESMIR, 2016). The range this research is focused on lies with the embedded & distributed generation, just below utility scale; therefore between 10kW – 5MW. When reading the Energy Services: Energy efficiency and embedded generation – 2016 Market Intelligence Report, it was found that energy efficiency and embedded generation could now be defined as energy services, where both demand as well as supply side management as well as generation solutions where being provided to the market (Raw, 2016). This then moves away from the concept of only consuming the resource (electricity), and embodies a sense that in order to attain and in-fact retain sustainability, the market needs to also incorporate embedded generation into the mix.

> Collectively these factors (rising electricity prices, energy security, supportive energy policies and incentives) are causing consumers to look towards alternative energy options. Lower technology costs, coupled with this increased demand, form the major driver for the energy services market in South Africa (Raw, 2016 pg. 10 lines 56 - 68).

ELECTRICITY DISTRIBUTION STRUCTURE AS IT CURRENTLY STANDS IN SOUTH AFRICA:

The Energy Services: Energy efficiency and embedded generation – 2016 Market Intelligence Report, breaks down the spheres of government that are responsible for both energy distribution as well as regulation within South Africa, these are: The Department of Energy (who is the custodian of energy policy & security in South Africa), The Department of Public Enterprises (responsible for the country's energy infrastructure), Eskom (owning distribution infrastructure), NERSA (that regulates and approves annual tariff increases), and local government / municipalities (responsible for a large portions of electricity distribution in the country), (Raw, 2016). Seeing that the sales and distribution of electricity is in essence an intrinsic part of local government revenues, this might explain why the progression towards property self-sufficiency is taking so long to come to light. Once real estate goes self-sufficient, that would mean less revenues for the state, while achieving energy goals for the country, introducing a conflict of interest for the state as the situation would be a double-edge sword

for the parties involved (de Vos, 2015). The suggestion through this research would advocate for an energy mix that would promote for a smart-grid system. This would see energy goals for the country met with greater generation capacity and decentralization of production, a stabilization in the country's energy situation (load-shedding), a higher valuing of real estate / retail real estate across the board due to bulk-services infrastructure investments (smart-grid upgrading), as well as a distribution strategy that could still allow local government to generate revenue if they work in conjunction with Eskom (possibly on the infrastructure maintenance side).

Gauging from the research that has been carried out, it does not seem that the current state of affairs when it comes to the listed retail sector will be easily solved: by-in from tenants is necessary (causing them to rethink their business model), the issue of irrecoverable Capex needs to be agreed to by both tenant as well as Developer, listed investors wanting returns they are used to receiving at 6% – 10% growth per annum, and the value of the asset almost doubling meaning slower returns for the developer or a lower yield in the short-run; all these factors are difficult to solve and at times comprehend, and fuel a situation where it is simpler to keep the status quo as is and make profits, rather than tamper with the system that works. Through this research a market understanding has been attained and the issues laid to bear, the next step would be to tackle each issue individually moving forward.

NATIONAL INFRASTRUCTURE ELECTRICITY GRID:

In the CONCEPT REPORT: The South African energy landscape by Dirk de Vos, it was discussed that the South African Grid, it was estimated needed as much as R163 billion to get it to Grid Code Standard. The grid in its' current state in order for it to accept new generation let alone accept the intervention proposed in this research, will need immense investment in order for it to be robust (de Vos, 2015). This is a major factor that can only be addressed by the private sector through their investment, or else it will see the state taking out expensive loans (FDI – foreign direct investments) of which the terms would not necessarily be favourable to the nation in the medium to long-run.

PROGRESSIVE REGULATIONS SEEING US INTO THE FUTURE:

12L Income Tax Allowance on Energy Efficiency Savings:

This regulation / tax allowance makes it viable for businesses to offset against their annual corporate tax as a direct result of their energy savings in a given year (Didiza, 2015). It further allows for additional depreciation allowances (up to 55%) for green-field projects over R200 million (Raw, 2016). Regulations 12C, 11E, and 13, provide for Energy Service Companies and other compliant businesses in terms of general depreciation of asset allowances (Raw, 2016).

> In the Western Cape, ten municipalities allow embedded generation to feed electricity back onto their grid. Within these municipalities there are three experimental feed-in tariffs and one NERSA approved tariff. The national utility (Eskom) does not allow embedded generation on their low-voltage network but they do permit the connection of embedded generation to their medium-voltage and high-voltage (Genflex tariff) network (Raw, 2016 pg. 18, lines 1 - 10).

Through such interventions, tangible results will be attained, further bringing the vision to life of a real estate market embedded into electricity generation and plugged into the grid.

The one code that will have to be abided by once the grid has been upgraded is the South African Distribution Code; this code applies to all entities connected to the distribution network, including embedded generators, as such it sets the rules for connecting to the distribution network and specifies the technical requirements to ensure the safety and reliability of the distribution network. The second code to be kept in mind is the South African Renewable Power Plants Grid Code, this sets out the technical and design grid connection requirements for renewable power plants between 0 – 1 MVA Low voltage (Raw, 2016).

Other codes to be cognizant of are: the NRS 048 series (covering grid quality parameters), the NRS 048-2 and NRS 048-4 (focused on the operation and connection to the municipal electrical grid), factors including compatibility levels, voltage characteristics, and application guidelines for utilities’; NRS 097-1 (Code of Practice for the interconnection of embedded generation to electricity distribution networks), and code NRS 097-2 (Grid interconnection of embedded generation: Part 2 Small Scale Embedded Generation), (Raw, 2016).

All these regulations prove progress as well as what is currently happening in terms of the national electricity infrastructure in South Africa; further researches should delve into them and test the progress over the years made.

In closing the possible solutions were described and delved into, with the use of real estate as a conduit for a sustainable, renewable, and self-sufficient, electricity generating asset, that would have the capability and capacity of generating electricity and plugging it into the existing electricity grid, while creating a green portfolio of assets that are almost invaluable in the long-run. The listed retail property sector has a bright future ahead of it, if it decides to progress towards a natural evolution of development, one that is inclusive of change, and not stagnated in doing business the way it was done ten years ago; but with all that been mentioned, this intervention would be a five to ten year development strategy that could be worked towards, and would create a new benchmark for listed commercial regional & super-regional retail developments within Gauteng, but seems to be out of reach if it had to be effected immediately; the next five (5) years could be a totally different story where this research could be seen to be totally outdated, but would still leave aspects of what has been thought about in this paper as standard industry practice.

NEAR-FUTURE CONCERNS: POINTS TO PONDER

Jackline Okeyo as well as Mveleli Nqwazi raised an interesting point of which further research would be recommended, and would require more time to conduct correctly:

The idea of municipal bulk-service infrastructure contributions that currently developers are levied with for all new developments; these would warrant a rebate from municipalities as the infrastructure upgrades would upgrade the entire community and not only the specific development, but what if those were directed towards a smart-grid system instead? That would then promote the idea of development self-sufficiency while contributing to the greater development well-being of our economy / country.

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6.64 Energy Services: Energy efficiency and embedded generation

6.65 Concept report - The South African energy landscape

7 ANNEXURES

Annexure A

INTERVIEW STRUCTURE

Research Question:

What are the **current circumstances**, **transitional responses**, and **possible solutions** to achieving energy self-sufficiency in new **listed** regional and super-regional retail developments within Gauteng?

Interview themes: To be sent to Interviewees

1. Current and transitional responses to an ailing electricity supply sector within South Africa.
2. Development goals and forecasts for listed retail property developments within Gauteng for the next five to ten years.
3. Feasibility and sustainability of retail property developments integrating into the current electricity grid.
4. Possible niche markets and opportunities arising from the possibility of electricity production decentralization.
5. Concept transferability of retail real estate self-sufficiency within South Africa.

Probing & Exploratory Questions:

1.

1.1 In your opinion, what would a lack of electricity security mean to the property development industry in terms of sustainability, self-sufficiency, and feasibility?

1.2 In your opinion, do you think energy efficiency strategies are adequately dealing with the demand GAP for electricity?

1.3 In your opinion, is the current stock of retail buildings reactive or proactive when it comes to energy self-sufficiency; and what could the possible causes for this be?

2.

2.1 As someone who represents a commercial real estate company, what strategies are being put in place for current retail stock energy efficiency, and future retail development self-sufficiency?

2.2 What is the importance and regard of green building in the listed property sector?

2.3 Should electricity generating infrastructure be considered when conceptualizing real estate developments?

3.

3.1 What is your understanding of the perceived cost vs benefit relationship, of building green retail developments (the capital outlay, yield margins, and value)?

3.2 Do listed property companies have an investment appetite for green retail developments, and why?

3.3 If houses can plug electricity back into the national grid through a procedure of reverse metering, do you foresee retail developments doing the same in time?

4.

4.1 Do you think energy generation decentralization, could be a possible solution, with multiple power sources plugging into the national electricity grid?

5.

5.1 Do you believe that the South African market is ready for electricity generating retail developments?