Gauteng 2034 development strategy
Energy trend paper

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Summary of key Gauteng energy issues and priorities for addressing these:

	Energy Issues	*Nature of the issue and priorities for addressing these*
1	**Energy security**	• Electricity supply crisis (lack of supply and cost escalation and volatility) and rising oil price (peak oil): ➢ Focus on: a) energy efficiency and demand side management and b) diversifying supply to include a greater range of energy sources and suppliers – prioritise low carbon options (solar power in particular due to excellent solar quotient of Gauteng).
2	**Carbon mitigation and environmental impacts**	• Highly energy intensive economic profile dependent on carbon intensive energy sources (electricity from coal or direct use of coal); very low levels of efficiency): ➢ Focus on reducing carbon and localized pollutant emissions through prioritising energy efficiency and renewable / cleaner energy sources ➢ Stimulate GHG (greenhouse gas) mitigating energy projects on a large scale and develop carbon market ➢ Factor environmental costs into energy supply and usage costs.
3	**Economic development and competitiveness**	• High carbon, energy intensive economic profile: ➢ Build a less resource dependent economy, aiming to decouple energy consumption from economic growth in order to support competitiveness in the future. ➢ Build locally based energy business: stimulate and take advantage of demand for new energy technologies and energy efficiency interventions (audits, retrofits, training) – potential for Gauteng to become solar water heater production hub for local and international markets ➢ Stimulate and support renewable energy market and supply.
4	**Energy poverty**	• Poor households have inadequate access to adequate energy services and / or are dependent on unsafe, inconvenient and unhealthy fuels (coal in particular). Indoor air pollution a major health hazard; high expenditure by poor households in meeting their energy needs (including transport): ➢ Improve access to and affordability of electricity by the poor; build and retrofit housing for energy efficiency; build well-located compact housing; provide energy information and education ➢ Introduce of stepped block tariffs in order to ensure that smaller consumers are not subsidizing large consumers.
5	**Spatial development form and management**	• Inefficient development form builds car dependent population and/or time-consuming, costly commuting; rising cost (energy and carbon) of transporting goods long distances: ➢ Follow SMART[1] growth planning principles to develop compact spatial form and development mix which provides optimal access to urban goods ➢ Support spatial development mix which will reduce distance that goods must travel from resource to manufacture to consumer.
6	**Transport**	• Congestion in cities, inadequate public transport, long distance freight ➢ Improve public transport and ensure that spatial development is informed by public transport needs ➢ Reduce distance that goods must travel from resource to manufacture to consumer through spatial development mix, support rail freight over road transport of goods.
7	**Impacts of climate change**	• Development not resilient to climate change impacts: ➢ Establish risk scenarios and adaptation interventions (implement sustainable development principles), build resilience of vulnerable communities (particularly the poor) and ecosystems.
8	**Institutional capacity**	• Very limited institutional and human capacity at all levels of government to manage and develop energy sector appropriately, lack of leadership and lack of effective regulation and incentives, lack of delegated powers to local government to address energy issues, need to clarify relationship between different spheres of govt with regard to energy (clarity is urgently required regarding the Regional Electricity Distributors): ➢ Support development of energy role and delegated powers for the cities

[1] www.smartgrowth.org

		➢ Establish skills development programmes ➢ Support and promote the development of appropriate national policy and regulations.

Note: *Separate theme papers deal with air pollution, transport and climate change risks and impacts – this paper therefore, except for carbon emissions, does not deal with these in any detail.*

1. The Energy system, key terms and concepts

Energy units

10^6 J	MJ	megajoule	1 Watt(W) = 1 joule per second
10^9 J	GJ	gigajoule	1 kilowatt hour (kWh) = 1000 Watts per hour
10^{12} J	TJ	terajoule	1Gigawatt hour (GWh) = 1 billion Watts per hour
10^{15} J	PJ	petajoule	

- *Carbon trading* – the trading of greenhouse gas emission reductions (CERs) via energy efficiency and cleaner energy projects
- *CDM (Clean Development Mechanism)* – a means by which developing countries can sell their CERs to developed countries (developing countries do not yet have obligatory emissions reduction targets)
- *Decoupling energy from economic growth* (producing the same or more goods and services with increasingly less energy).
- *Demand side management (DSM)* – the management of the demand for energy (usually electricity), can include energy efficiency and shifting of energy demand at peak times (usually morning and evening)
- *Energy carrier* - a substance or system that can be used to produce mechanical work or heat or to operate chemical or physical processes
- *Energy efficiency:* the efficiency with which energy is converted and consumed to complete a given task or to produce certain goods and services
- *Energy intensity (measured as the number of units of energy per unit of product – for example joules per unit of GDP* – provides a measure of the energy intensity of an economy or a product. This measurement is useful in comparing different economies and products and for tracking efforts to reduce the energy intensity of an economy. Per capita energy intensities and the associated emissions intensity of production can also be measured and reflected in this way.
- *Energy services* – what energy is used for, for example cooking, lighting, water heating, welding etc.
- *LTMS or Long Term Mitigation Scenarios* - scenarios prepared for the Dept of Environment and Tourism regarding options for mitigating GHG emissions in South Africa in the long term..
- *Peak load shifting* – moving demand from times of high demand (usually morning and evening) to times of lower demand
- *Peak oil* – see footnote 5
- *Renewable energy* – energy from sources such as the sun or wind that do not get depleted with use.
- *Supply and demand (supply led vs demand led approaches)* - see 2 below.

2. Energy processes

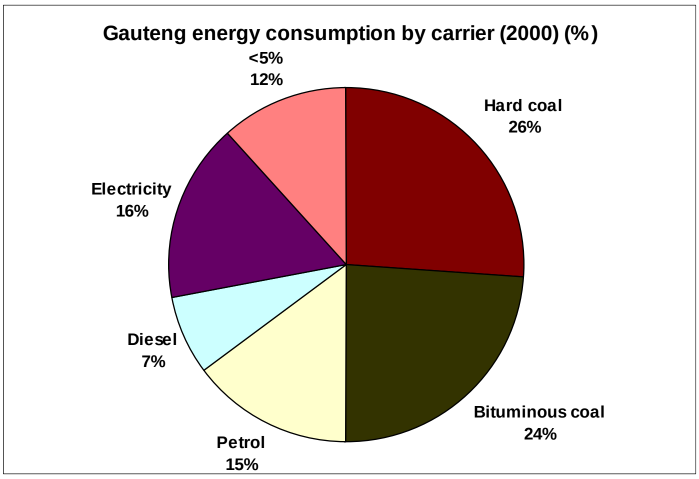
The *energy value chain* is the extraction of primary energy sources (such as coal), conversion of these to a useable form of energy (such as electricity) and the distribution and consumption of this energy. In South Africa, the impact on the environment, on people's health and other so-called external costs (also called externalities) of this value chain have not to date been included in deriving its costs. Another way that this is stated is that the "real costs" have not been included.

Historically in South Africa energy planning and policy development was driven by the issue of supply (what energy sources are available) and by supply industry needs. Since 1994 there has been some effort to develop a more equitable and sustainable approach which considers demand first (what are the energy service needs of households, commerce and industry and how these can best be met). Many energy service needs do not require a supply of energy (for example the need for a warm house can be met at least in part by installing insulated ceilings). This is called a *demand-led approach* and is used by progressive economies around the world.

Energy is a cross-cutting sector and is an essential component of all economic and social activities. In Gauteng in particular energy is an inextricable part of the minerals and energy complex on which the economy remains predominantly built.

3. **Past trends and current position** *Note: the quality and availability of energy data for Gauteng Province and nationally is inadequate to be able to track trends*[2]*. The most recent available Provincial data across all sectors is for 2000. More recent and reliable data is available for the three major Metros Tshwane, Joburg and Ekurhuleni through their State of Energy Reports (SEA Gauteng Data Report 2008).*

Gauteng is responsible for about one third of South Africa's energy consumption and carbon emissions. It similarly contributes one third of the national GDP. The ratio of these indicators, as shown in Figure 5 is a useful metric for monitoring energy efficiency performance relative to other provinces.



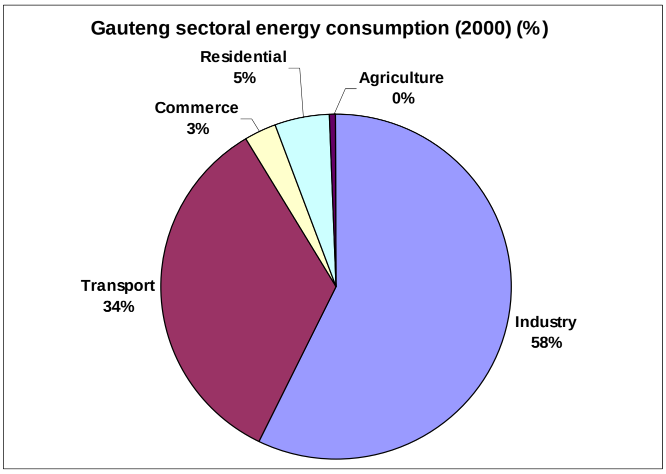


Figure 1. Gauteng energy consumption by carrier 2000

Figure 2. Gauteng energy consumption by sector 2000

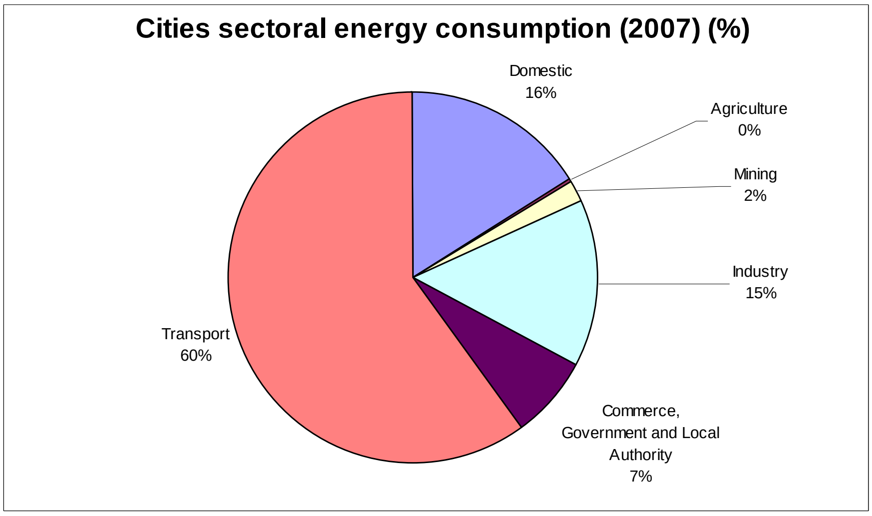


Figure 3. Three Gauteng Metros energy consumption by sector 2007

Figure 1 provides an overview of Provincial energy consumption (total 780 PJ yr 2000) by energy carrier. Roughly 50% of energy is used in the direct combustion of coal with the only other significant carriers being electricity and liquid fuels at around 20% each. An energy demand breakdown per sector is shown in Figure 2. More than 90% of energy consumption in Gauteng is by the industrial and transport sectors at 58% and 34% respectively (see Figure 9 for Industrial Subsectors Energy Consumption). This is quite different to the energy consumption pattern for the three Metros (Joburg, Ekurhuleni and Tshwane), as shown in Figure 3, where industry accounts for 14% and transport for 60% of energy demand (47% of transport energy in the Metros is petrol, 28% diesel and 22% jet fuel). Total energy consumption for the three Metros in 2007 was 490 PJ.

The most important Provincial economic sectors are financial and business services, logistics and communications, and mining. The intention is for the Province's economy to move away from traditional heavy industry markets and low value-added production towards sophisticated high value-added production, particularly in information technology, telecoms and other high-tech industries (GPG, 2007). In an international survey in 2000, Gauteng was identified as one of 46 global hubs of technological innovation. The burgeoning high-tech corridor in Midrand is the fastest developing area in the country.

[2] Provincial energy balances have been the primary data source for identifying trends, the most recent data available being 1996 to 2000. Some research is underway by UCT and Sustainable Energy Africa as part of the ENERKEY project - no data is available from this project as yet (apart from a summary of the 3 Metros State of Energy Reports). Sustainable Energy Africa have recently been appointed to develop the Gauteng Energy Strategy.

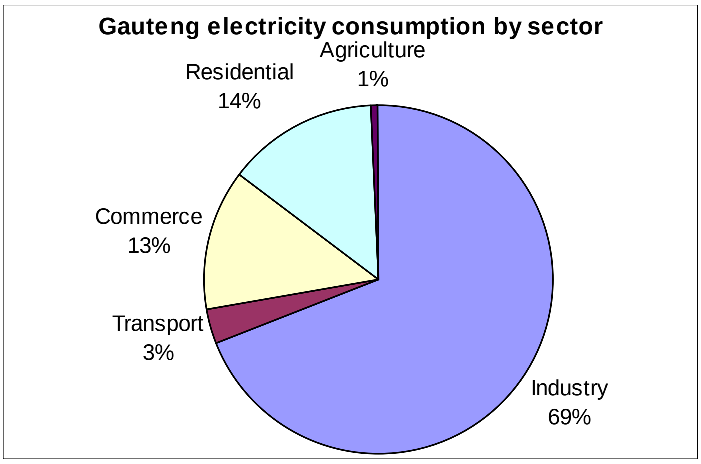


Figure 4. Gauteng electricity consumption by sector 2000

Gauteng is a significant consumer of electricity, predominantly from Eskom's coal fired power stations in Mpumulanga. However, many industries generate their own energy using coal as a primary energy source. As low-grade coal is used in these operations and in the power stations, Gauteng's emissions load is extremely high[3]. At 128mt CO_2 per annum (2000) (excluding distribution losses), Gauteng has the highest greenhouse gas (GHG) emissions of any province. It is estimated that national emissions in 2000 stood at 400mt (Long Term Mitigation Scenarios (LTMS)[4] – see Figure 6) which means that Gauteng was producing about 32% of the national GHGs in 2000. The industrial sector in Gauteng alone accounts for 80mt CO_2/annum or a massive 20% of the national inventory. Households contribute 10 mt CO_2e or around 8% of the Provincial GHG emissions.

With only 1.4% of South Africa's land area Gauteng is relatively poorly endowed with locally available stock energy resources. Most solid (coal), liquid and gaseous fuels are transported into the Province from elsewhere in the country or sourced internationally. However, Gauteng enjoys excellent solar radiation at an average 6 kWh/m^2/day throughout the year. It also experiences some of the highest global sunshine in mid-winter.

Limited data available for the period 1996 to 2000 is presented in

Table 1 and adapted for
Figure 5. Strong trends are not discernable from this limited data set. However, it appears that Gauteng managed a decrease in relative energy intensity over this period while increasing its relative contribution to GDP over the same period. If this has been the trend, it must be reinforced into the future.

Table 1 Energy Consumption vs Production for Gauteng relative to RSA

	1996	1997	1998	1999	2000
Gauteng (PJ)	750	752	759	766	783
RSA (PJ)	2138	2159	2194	2230	2296
Gauteng % total energy	35.1	34.9	34.6	34.4	34.1
Gauteng % GDP contribution	-	33.1	33.3	33.3	33.8

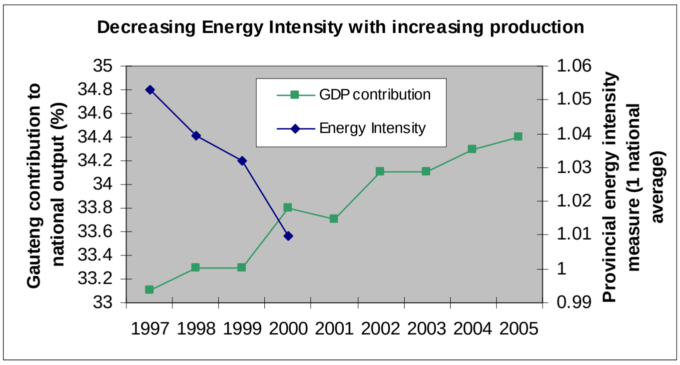


Figure 5. Trends in energy consumption vs. economic production

[3] Gauteng State of Environment Report 2004
[4] LTMS Project 2008: Cabinet decision taken in July 2008 to go the "required by science" carbon route which implies a reduction in GHGs of between 60 and 80% by 2050, see Fig 6.

4. Future trends

Over the next 5 to 10 years under a business as usual scenario, Gauteng's demand for energy will grow to meet the demands of economic growth and of a growing population. Simultaneously, given peak oil scenarios, it is likely that the price of oil will continue to rise; South Africa's electricity supply crisis will not be resolved in the medium term (nuclear and new large coal power stations typically take 6 to 15 years to become operational) and electricity prices will also continue to rise.

In the face of the Peak Oil[5] and the associated global energy crisis, our own local electricity crisis and growing climate change impacts as a result of greenhouse gas (GHG) emissions, it is imperative that Gauteng, as the region with the highest GDP per capita, highest rate of economic growth and highest energy usage (both in real terms and in terms of per unit of GDP), takes a leading role in defining its energy use picture and devising strategies to substantially reduce energy use in all sectors to be more competitive and sustainable in the years to come6. As the region's energy use is concentrated in its large and powerful conurbation of Joburg, Ekhuruleni and Tshwane, much of the challenge lies with the cities.

High carbon, energy intensive economies will increasingly become unattractive for economic investment. The trend internationally is towards low carbon economies and decoupling energy consumption from growth. This is partly driven by developed countries' obligatory emissions targets and partly by the harsh realities of volatile energy prices and resource depletion. This means aggressively pursuing energy efficiency as well as including a cleaner mix with renewable energy as a significant contributor.

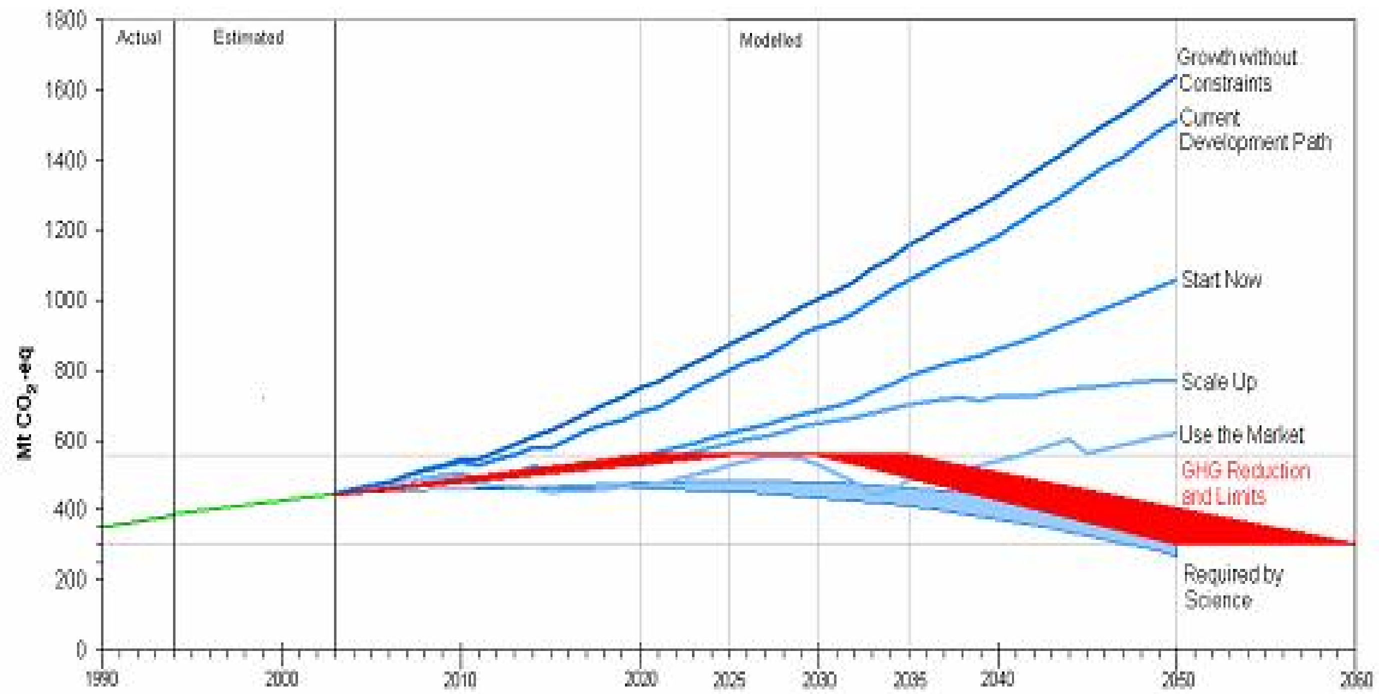


Figure 6. LTMS GHG emission path options for the future 2008 (DEAT)

The recent decision by Cabinet (28 July 2008) to implement the "required by science" carbon route (reduction in GHGs of between 30-40% below 2003 values by 2050 which amounts to mitigation of about 1300Mt of GHG per year, as indicated in
Figure **6**) means that energy efficiency and renewable energy sources must be fundamental to any economic development plans for the future and for management of existing development. Energy consumption is responsible approximately 80% of greenhouse gas emissions. A business as usual or 'growth without constraints' approach will have dire economic consequences for the Province. Figures 7 provides an indication of the longer term cost (and carbon) benefits of pursuing renewable energy supply for the Province. The price of electricity generated from renewables is increasingly competitive with fossil and nuclear based electricity generation (DEADP, 2007).

[5] Peak oil: The concept of 'Peak Oil' refers to the midpoint of global hydrocarbon production. There is general consensus that we are past the peak of supply globally – the consequences are not hard to predict: extraction becomes increasingly expensive and supplies increasingly limited. Gauteng is almost entirely dependent on fossil fuels (see Figure 1). Scenarios to 2034 must include the decrease in dependency on global oil and local coal extraction. The shift to renewable sources coupled with forced improved efficiency will be a reality. This is consistent with projections of the need for greenhouse gas peak, plateau and decline outlined in Figure 6.

[6] Sustainable Energy Africa 2008

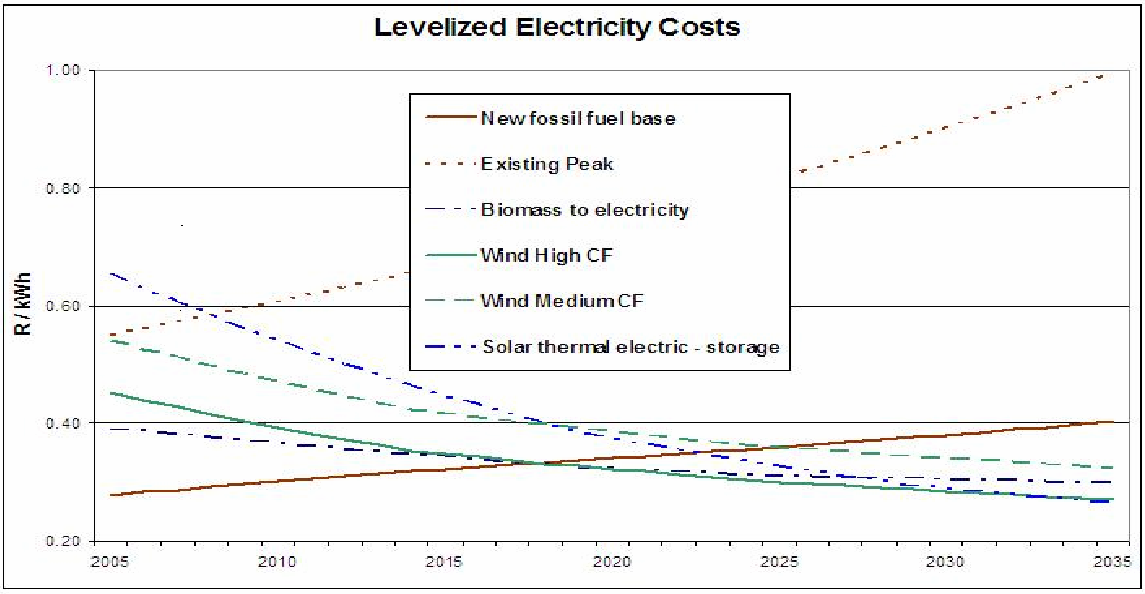


Figure 7. Electricity costs per technology (Banks and Schäffler, 2007). CF = capacity factor

While diversification of energy supply sources is important, so is diversification of control over generation and supply. This can be achieved by supporting independent power producers and supporting small scale power generation from renewable energy sources. As job creation is a critical to the Province, Figure 9 below provides a comparative picture of jobs for different energy technologies per unit of energy. It is clear that renewable energy sources are much more labour intensive – and these jobs are more likely to be local.

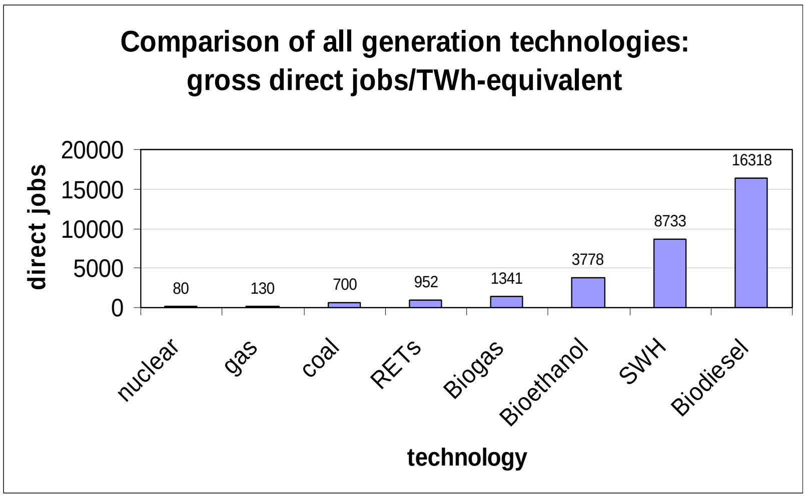


Figure 8. Jobs per TWh for different generation technologies (SECCP 2003) RETs: Renewable Energy Technoligies

Market surveys in the domestic, commercial and industrial sectors (DME, 2007) have shown evidence of a market for green electricity to be purchased at a premium. Given current leadership demonstrated by the Western Cape Provincial Government in terms of sustainable energy strategy (WC Sustainable Energy White Paper Oct 2008) development and significant wind and wave resources in particular, this may need to be imported from other Provinces (also see DEADP 2007). Developing markets for green electricity not only promotes renewable and energy efficiency industries, but includes the local benefits of a transition to these energy source. Gauteng Provincial Government is currently busy with developing a Gauteng Energy Strategy with Sustainable Energy Africa.

5. Global and African prospects

See 6. below. In the short term Gauteng should be positioning itself to take advantage of the growing carbon market (this is likely to become the most heavily traded market in the world). This will assist in building a lower carbon economy in the longer term which will better position the Province for international investment and economic competitiveness. The Province can become a development hub for new energy technologies, particularly solar water heaters.

6. Key Driving forces: Opportunities and Threats 5 years (2014) and 5+ years (2020)

Opportunities

As the Gauteng economic base is inefficient in its use of energy, there are a number of "low hanging fruit" which the Province can capitalise on. Many far reaching interventions to introduce energy efficiency and even cleaner technologies are inexpensive and the carbon credits can be traded internationally to offset a portion of the cost. In a climate of rising energy prices, most interventions have short payback periods.

For example:
The Metro Energy Strategies all contain solar water heater (SWH) targets. A target of 10% of households within the next 3 years translates as 215 000 SWHs within the next 3 years. The added value of these SWHs is approximately R1.5 billion (and once installed provide savings of 488 GWh/annum, approximately 500 ktCO_2/annum and peak electricity savings of 120 MW, and a saving over a 5 year period to each householder of R 8 600)[7] – there are clearly significant business and job creation opportunities here and it is conceivable that Gauteng, as the most industrialised province could become the SWH production hub for the country, the region and beyond. This business would need to be supported by the introduction of legislation and incentives. Other opportunities exist in the fields of energy efficient lighting, solar cooling and electric vehicles.

Electricity generation through solar thermal technology (as well as through photovoltaics) is proving to be increasingly effective. Gauteng is ideally placed for solar technologies due to its high solar quotient. Implementation requires support and Gauteng Province can promote this through supporting the allocation of land, the implementation of feed-in tariffs, technological innovation and training.

Threats

An energy intensive high carbon economy, with a high dependency on electricity from a single source and single utility is undoubtedly a poor basis for economic growth in the context of the South African electricity crisis, and looming obligatory carbon reduction targets. A transport system which is highly dependent on private vehicles and taxis for urban commuting is similarly a weak foundation in the context of peak oil. Gauteng industries will find it hard to compete as we enter an era where carbon and other emissions from production processes will make products less attractive and less competitive globally.

Lack of energy security, both with regard to electricity and oil, will create economic instability precipitating declining growth rates and reduced investment. A significant threat is that as our electricity and coal is relatively cheap in global terms and Gauteng is located close to these sources of supply - the path of least resistance and short term gains will see Gauteng continuing to attract highly energy intensive industries – thus compounding Gauteng's current low energy efficiency and high carbon profile.

7. International and regional competitors / collaborators

Competitors

Any country or region which has energy security, has a lower energy intensity and offers clean energy supply will increasingly become a serious competitor as investors progressively incorporate low carbon targets into their investment decisions. The Western Cape is positioning itself to attract high tech and service industry which is attracted by lower carbon greener environments.

Collaborators

There is much potential globally to collaborate with leading countries in the EU and elsewhere and for Gauteng to use opportunities to 'leap frog' in the fields of energy efficiency innovations and clean energy technologies.

8. Impacts of future growth and development

i. *Growth and Economic Output*
   Decoupling energy consumption from economic growth will reduce input costs, risk and carbon intensity. It will provide a significant platform for innovation and job creation in new areas.
ii. *Employment*

[7] Based on EMM, CTMM, JM Energy Strategies (3 Metros) and SESSA Solar Water Heating Division (April 2008) prepared for Eskom Holding Ltd.

A move to a low carbon localized energy supply system will create more local jobs. (see Figure 8 jobs/TWh graph). Most energy jobs currently are not in Gauteng, but in Mpumulanga.

iii. *BEE and BBBEE*
Skills development from plumbers to energy managers to engineers and scientists.

iv. *SMME development*
Smaller scale energy provision and independent power production offers many opportunities for small business development as does energy efficiency implementation through ESCOs (Energy Services Companies).

v. *Export potential*
As the solar technology production hub for country export potential for these technologies would be significant in the region and internationally.

vi. *Spatial development*
Development which pursues energy security and the development of a low carbon economy would prioritise efficient spatial development to minimize transport distances and dependence on private vehicles.

vii. *Environmental sustainability*
A low carbon economy is fundamental to environmental sustainability.

9. Institutions and governance

The main institutional and governance challenges for this sector lie in the lack of support from National Government or from the monopoly parastal Eskom for the building of low carbon economies, particularly with regard to energy supply (no feed-in tariff for renewable energy sources) and energy efficiency drivers (lack of support for DSM from government/Eskom). However, as the Province is endowed with powerful cities and a strong economy, Province has a vital role to play in supporting these cities to provide energy leadership in a national void.

The three major metros all have good Energy and Climate Change Strategies. They have however struggled to achieve any significant level of implementation. Province can facilitate implementation by the cities by providing coordination and promoting their needs at national level.

10. Investment and support interventions required

10.1 Sustainable Energy Strategies

Using previous strategy reports and state of energy reports (DEADP, 2007; Banks and Schäffler 2006 and 2007 and Energy and Climate Change Strategies and State of Energy Reports for the 3 metros) some likely strategies have been outlined for each of the demand sectors.

10.1.1 Domestic priority interventions

Solar water heaters
Efficient lighting
Ceilings in low income households
Energy efficient house design
Behaviour change

10.1.2 Industry

Industrial energy use is responsible for nearly 70% of the total energy use in Gauteng and approximately 20% of the national GHG emissions. It is difficult to generalise regarding efficiency or more sustainable interventions in this sector. However, large users of energy in the industrial sector are often process heating, furnaces and fans: efficiencies can be improved by technology change, but also by closing the energy loop within across industrial processes (using the ‘waste’ energy produced to power other processes). Figure 9 shows industrial energy consumption by sub-sector. The iron and steel , chemical and petro-chemical industries consume the most energy at 33% and 26% of the industrial total respectively. The provincial government must continue to work closely with these and other industrial subsectors to ensure increased productivity with enhanced energy efficiency.

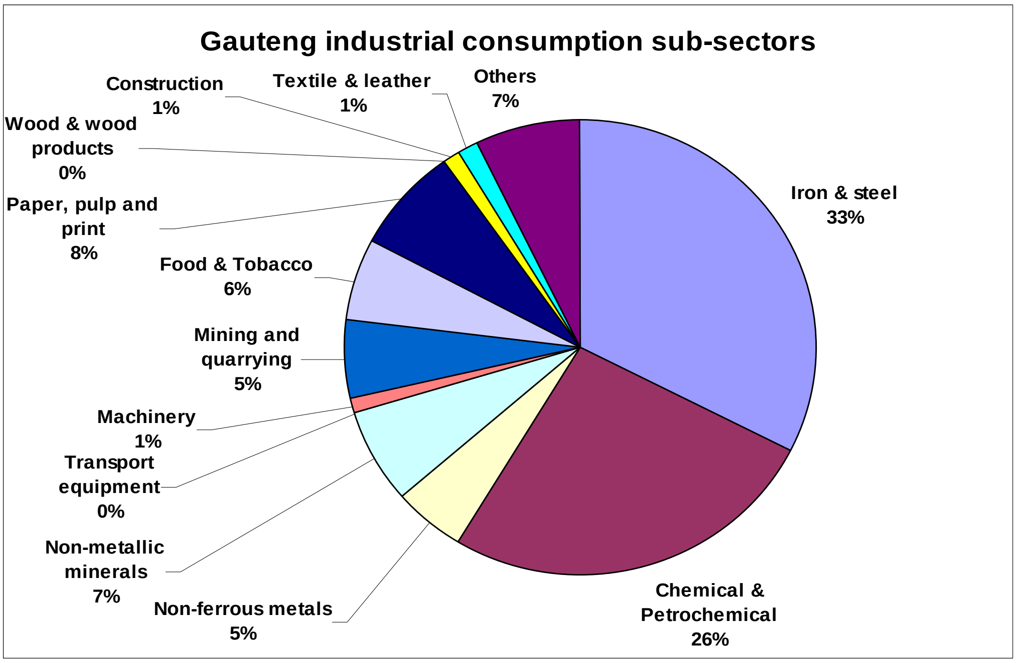


Figure 9 Gauteng Industrial subsectors energy consumption 2000

A key objective of the DME Energy Efficiency Strategy for South Africa is to bring energy intensities of major industrial sectors in line with international standards and best practice (DME, 2005). This requires energy audits of these major sectors to provide a baseline measure which may be improved upon. This will also provide data on which to build standard boiler, electric motor and insulation efficiencies to be used in industry. Cleaner energy interventions are also possible, such as switching from coal to natural gas for thermal processes.

Supporting the development of energy service companies (ESCOs) which specialise in the industrial sector is fundamental to promoting greater energy efficiency (DME, 2005).

10.1.3 Commerce and Government

Government and the commercial sector's energy profile is similar (excluding fleet). The largest contributors to energy use in the commercial sector are lighting and Heating-Ventilation-Air-Conditioning (HVAC), which according to Eskom account for 35% and 27% of electricity use respectively.

- Efficient lighting
- Efficient HVAC systems
- Development to Green Building standards

10.1.4 Transport

From the Energy Balances earlier in this document, it can be seen that the transport sector is responsible for 34% of the energy use in the province and a much as 60% of the energy use in the three municipalities combined. Energy savings within this sector would go a long way in saving energy across the three metros in particular.

Modal shift and energy demand
The best way to reduce energy use within the transport sector is to support a modal shift away from private transport towards public transport and non-motorised transport options. Figure 10 provides a graphic interpretation of public vs private transport energy demand – small increases in public transport energy demand translate into very large decreases in private transport energy demand.

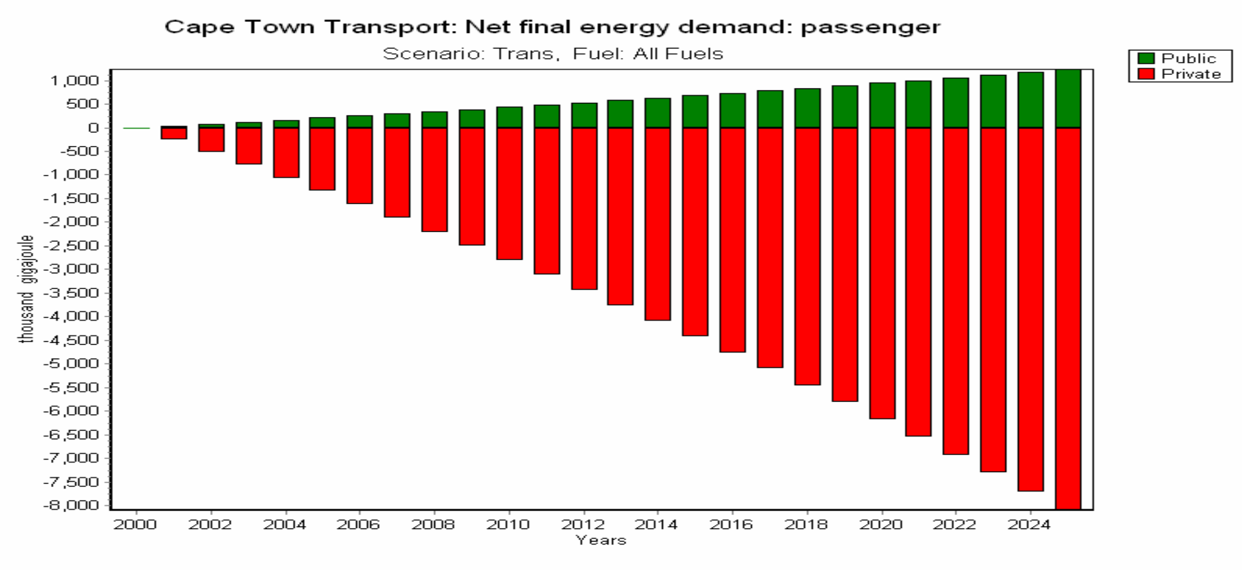


Figure 10 Comparison of energy demand of modal shift to public transport (SEA)

10.2 Renewable Energy Supply Technologies[8]

- Wide installation of solar-water heaters at all new housing, retrofit programme for existing houses
- Energy efficient and / solar-powered municipal installations (e.g. street lights and robots, etc.)
- Extensive utilization of solar panels at factories, institutional buildings and stadiums for heating and refrigeration
- Photovoltaic (PV) panels for generating electricity at large municipal installations (e.g. water treatment and wastewater treatment works, etc.)
- Large solar energy (rooftop and building integrated) generating plants to supplement existing national grid
- Large scale solar thermal plants
- Use of kinetic energy of gravity moving water in the municipal water supply and sanitation systems
- Small scale hydropower at existing dams/ weirs; also mining water circulated in operating or defunct mines
- Surplus biomass from efficient utilization of agricultural land
- Methane abstraction from large municipal landfills, municipal/industrial wastewater treatment plants
- Micro turbines run by solar PV for the information technology and other high value applications

Prefeasibility studies of energy efficiency and the most viable renewable energy options have been conducted for the Gauteng Energy Management Task Team (GEMTT) and some work has been done as part of this forum with regard to policy development and legislative review for the province. A range of provincial, city and other energy planning work is in progress. The co-ordination of these efforts will allow for accelerated progress in meeting the energy challenge.

11. Theme linkages

As energy cuts across all sectors and is a key component of development, making each sector less vulnerable to energy supply shortages and rising costs, and reducing carbon emissions for all sectors is fundamental to sustainable development for the Province. It is always cheaper and more environmentally sustainable to save energy than to buy it or make it.

12. Regional performance indicators

- Energy intensity (PJ / unit of GDP and /capita) per sector (in order to track energy efficiency) (see Figure 5)
- Carbon intensity: tons of CO_2/unit of GDP for each sector and for each energy carrier
- Air pollution measures (NO_x, SO_x, particulates) – local and indoor levels of pollution
- Diversification of supply: supply mix, and suppliers (per J)
- Devolution of control over supply: record of who owns energy supplied to the Province

[8] Barta, 2007. Renewable energy sources of energy for hybrid cogeneration in Gauteng. Gauteng Department of Local Government

- Governance: - energy staff, skills levels and location of staff (in national, provincial and local government), gender and racial profile of energy staff
  - regulations, incentives and enforcement
- Knowledge management: collection and management of data appropriately broken down to enable development of detailed picture. Transparency and accessibility of data to the public.

13. Further research required

The quality and availability of energy data is extremely poor. In order to achieve a comprehensive trackable understanding of Gauteng's energy picture it is vital that effective quantitative and qualitative data is collected. This needs to be part of a national programme of energy data management as it is crucial to be able to understand the energy picture of Gauteng in relative terms – relative to national, to other provinces, by industry type etc.

A Gauteng Energy Strategy is to be developed over the next year or so by Sustainable Energy Africa, commissioned by Gauteng Provincial Government. An energy strategy is usually driven by targets – in order to track progress towards these targets, effective data collection and analysis is essential.

14. Contact list

Following is a list of some of the people who were consulted or referred to in preparing this paper and may be helpful with further work in this area.

Ajay Tikram – Energy Research Centre UCT
Anton Eberhart - Graduate School of Business UCT
Barry Bredenkamp - NEEA (National Energy Efficiency Agency)
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Mark Borchers - Sustainable Energy Africa mark@sustainable.org.za
Mike Goldblatt - Palmer Development Group at mike@pdg.co.za
Philip Goyns - Programme Manager: Enerkey
Tony Golding - Dept Minerals and Energy
Yaw Afrane Okese - National Business Initiative

Organisations are listed below under References

Existing relevant initiatives:

- Gauteng Economic Development Agency (GEDA) call for proposal for overview of renewable energy initiatives
- Gauteng Provincial Govt (GPG) Energy Strategy development - Sustainable Energy Africa (current)
- Gauteng Energy Management Task Team (GMTT)
- Renewable Energy Market Transformation Programme c/o Development Bank of South Africa

15. References

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