ENERGY PLANNING COLLOQUIM

29-30 MARCH 2012

GALLAGHER CONVENTION CENTRE MIDRAND

2012 - "Year of Sustainable Energy for All"

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

1. BACKGROUND

Energy is essential to many human activities and is critical to the social and economic development of an economy. One of the key objectives of the Department of Energy is to ensure energy security, which in essence is about ensuring availability of energy resources and access to energy services, in an affordable and sustainable manner while minimising the associated adverse environmental impacts. However many factors pose potential threats to energy security including scarce and depleting energy resources, geopolitical instability, inadequate energy infrastructure, and more recently natural disasters. Therefore in order to ensure continued security of energy supply, it is essential that a coordinated and integrated approach to energy planning, which takes into account these complex issues, be undertaken.

The development of a national Integrated Energy Plan (IEP) was envisaged in the White Paper on Energy Policy of 1998 and the Minister of Energy, as per the National Energy Act, (Act No. 34 of 2008), is mandated to develop and on an annual basis review and publish the IEP in the Gazette. The purpose of the IEP is to provide a roadmap of the future energy landscape of South Africa which guides future energy infrastructure investments and policy development.

2. ENERGY PLANNING PROCESS

Energy Planning is about ensuring energy security while maintaining a balance of the three pillars of sustainable development: Social factors, Economic Development and Environmental Sustainability.

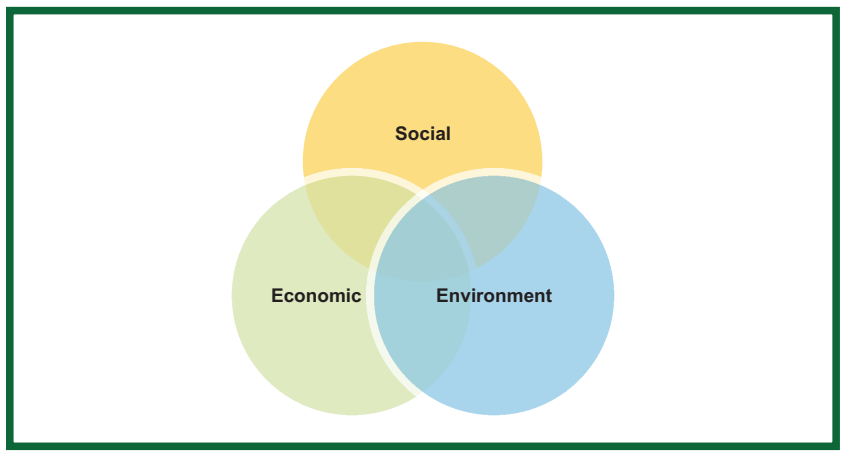
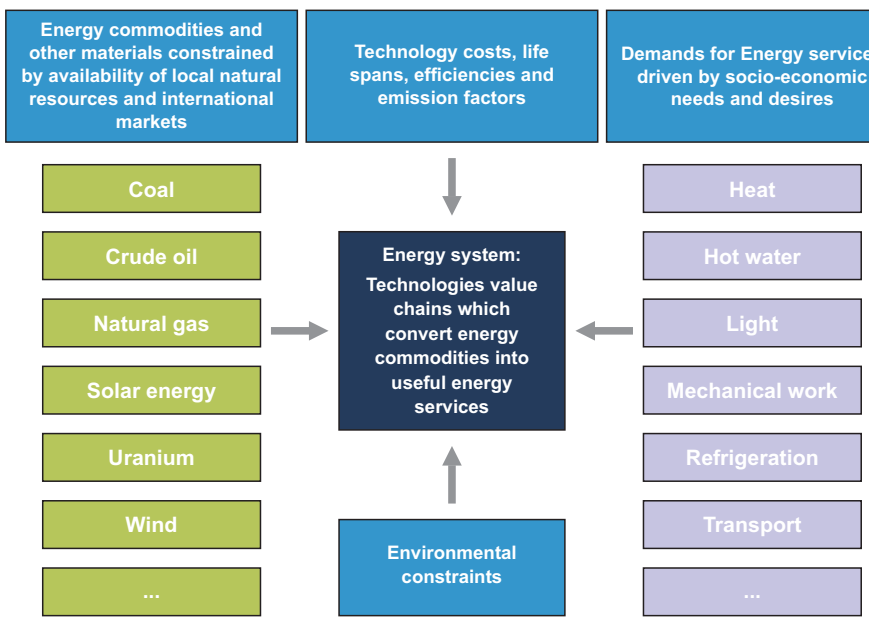


Figure 1: Three pillars of sustainable development

2.1. Understanding the Key Drivers of Supply and Demand and macroeconomic constraints within the Energy Sector



The energy planning process starts with understanding the energy services (e.g. cooking, space heating, transportation) for different categories of consumers (i.e. households, industry, transport, commerce) as well as understanding the key drivers and trends in consumption of such energy services (i.e. population growth, household income, economic development). From this basis, estimations of the future trends in the energy consumed to achieve the various services are conducted and the optimal mix of sources and forms of energy to meet these energy service needs in the most cost effective, efficient, socially beneficial and environmentally responsible manner is then proposed. In proposing the most optimal mix of technology options, environmental constraints and macroeconomic factors that influence the availability, cost and ease of access of these various options are then also considered. Regulatory and policy issues that could impact on the viability of proposed policy options also need to be considered. Such policy considerations could entail creating an enabling environment or putting in place certain targets or constraints to ensure the attainment of the objectives. It is in considering all these elements that policy recommendations are also made.

2.1.1. Historical Energy Consumption and Supply

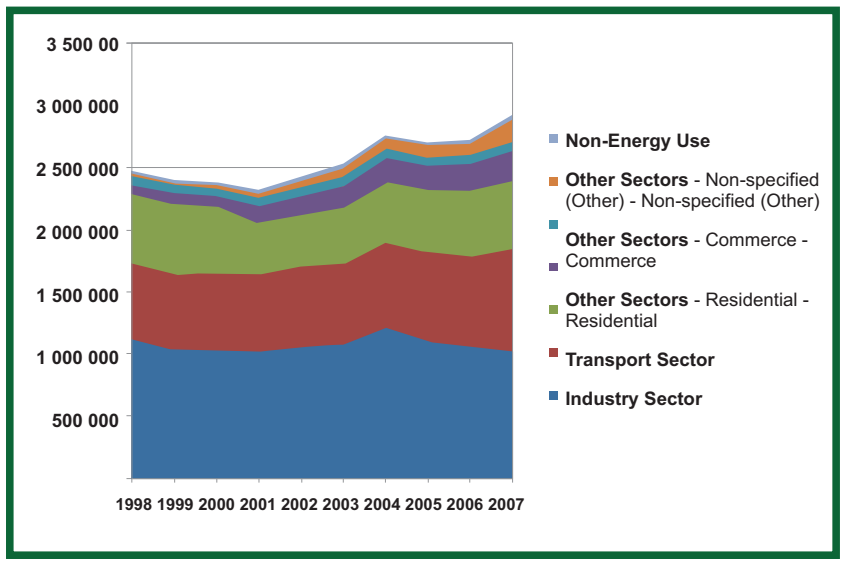


Figure 2: Historical Energy Consumption by Sector (TJ)

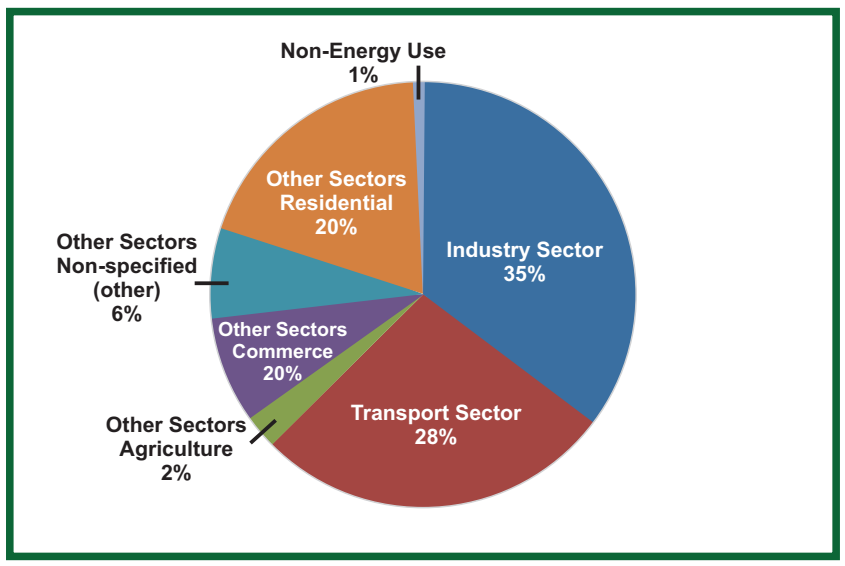


Figure 3: Share of Energy Consumption by Sector – 2007

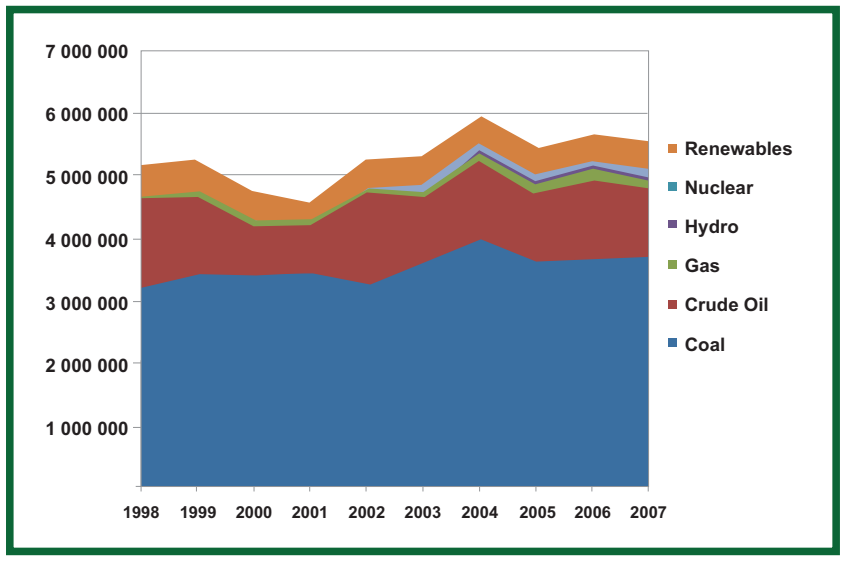


Figure 4: Domestic Supply of primary energy carrier (TJ)

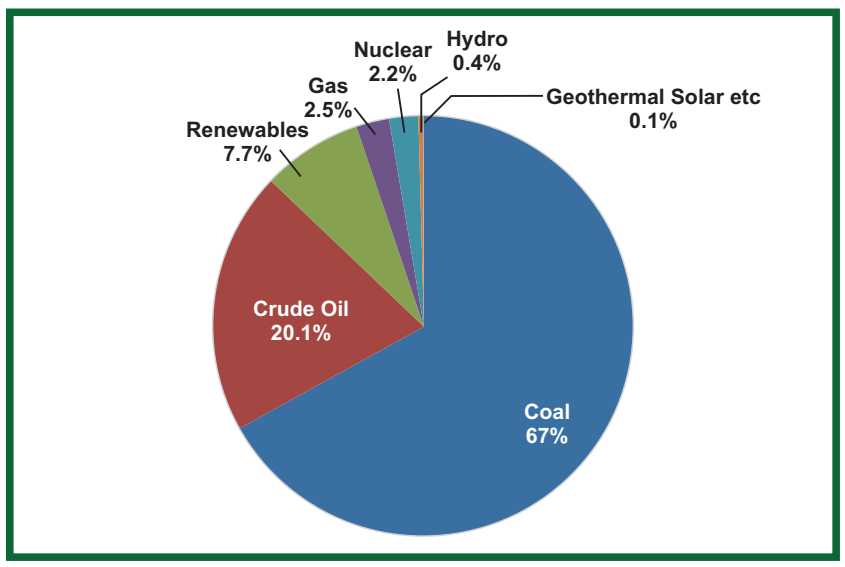


Figure 5: Share of domestic supply of primary energy by energy carrier - 2007

2.2. Evaluate Alternative Options

A critical element of energy planning is evaluating different alternatives that are available based on a predefined set of criteria agreed upon by a broad range of stakeholders. While certain criteria such as costs, emissions and water consumption associated with different energy carriers and technologies are fairly easy to quantify (if the supporting data is available) and can be easily described within the energy system; other criteria such as security of supply and socio-economic benefits such as localisation and access to energy are more subjective and difficult to quantify as they cannot be linked to a specific energy carrier or technology but rather have an impact of everyday lives. Criteria are chosen based on a set of competing but important objectives – which are oftentimes have conflicting impacts.

A list of some of the key objectives or criteria is indicated in the diagram above. As some of these are not easy to quantify, two approaches will be used to evaluate alternative options.

- **Quantitative analysis** will be conducted using the chosen optimisation model based on those criteria which are readily quantifiable. i.e. Given projected demand for different energy services as well as the available energy resources and technologies; the most efficient technologies, which emit the least greenhouse gases, with the minimum discounted capital and operating costs, and which use the least water, will be selected.
- **Qualitative analysis** on other criteria will be conducted using a Multi-Criteria Decision Analysis (MCDA) approach. The final list of criteria, the relative importance and resultant weight of each of the criteria will be determined through a consensus approach. While this approach cannot and does not aim to remove subjectivity in its entirety, it aims to minimise

personal sentiment from the analysis process in that once the list of criteria has been decided upon and weighted, the same set of criteria will be used consistently to evaluate all alternative options.

The outcomes from both the quantitative and qualitative process will inform the final policy recommendations in the IEP.

2.3. Recommendations

Once recommendations are made, the responsibility of developing an implementation plan to put the recommendations into action may rest with different policy units within the Department, and it may to a certain extent also involve other government departments and stakeholders outside of government. For example, if a recommendation from the IEP is that Liquefied Petroleum Gas (LPG) needs to play a bigger role as a fuel within households and small businesses, the IEP would indicate or quantify the extent to which lowering the price of LPG could have on future electricity consumptions patterns across different sectors – assuming that all implementation constraints are addressed. The IEP will however also highlight key implementation challenges that should be addressed and where possible mechanisms of addressing them. In the case of rolling out LPG to the market, it may well be the case that even if critical factors such as pricing are addressed, other socio-economic challenges that inhibit the viability of LPG as a practical alternative to electricity exist – examples could include factors such as accessibility of filling stations to consumers; the weight of gas cylinders which make it impractical to carry them over long distances; negative perceptions about the safety of gas; and other inconvenience factors.

The steps to Develop an Action Plan; Implement; and Monitor and Report Progress to deal with these key challenges will take place once the IEP has been promulgated. Lastly the step to Review and Enhance ensures that from the various implementation plans, there is a mechanism of providing feedback into the energy planning process.

3. DEALING WITH KEY UNCERTAINTIES

Long-term planning is laden with many risks and uncertainties. Scenario-planning has been used as a mechanisms of planning for alternative strategies to deal with long-term uncertainties as it is premised on the principle that the future is indeterminate and can therefore differ greatly from what it is at present. There are infinite possibilities of what the future could look like and it is therefore not possible to plan for every eventuality; however it is reasonable to plan for those eventualities that may be caused by key driving forces which are deemed important within the environment in which one operates. It is often those key driving forces for which there is little or no control and for which there is least certainty that have the most impact on the realization of objectives and therefore it is the variations in those driving forces that should be planned for.

The question that the scenario-based planning methodology seeks to answer is “what can we do now in order to prepare for the different futures that may possibly become?” Scenario planning is often recommended whenever the problem is complex, uncertain and has long-term effects. Scenario building is a method that will enable the department to define plausible social, economic and environmental future states of South Africa. It enables systematic, simplified and structured approach to consideration of complex and competing objectives that South Africa faces, and this is the approach that has been adopted for the IEP.

3.1. Plausible Futures

The scenario-planning approach will be used to deal with key uncertainties about the future. A key step in scenario-planning entails defining plausible futures which are storylines about future possible eventualities. Plausible Futures describe different contexts against which different policies can be pursued and recommendations made. These pictures of plausible futures may be either desired or feared. The basis of choosing futures should be to consider only those variables for which there is least certainty and least control. The set of variables should also be those that would have the most impact on our ability to meet the defined objectives. The plausible futures eventually chosen should therefore have a likely probability and high impact.

The process of estimating demand; understanding the different supply options and technologies that are available; understanding key macroeconomic and other constraints which may present themselves are contextualised within different plausible futures. Therefore the options and recommendations which

are viable in one plausible future may be less viable in another plausible future.

Five plausible futures have been chosen for the IEP process and will be discussed in detail during the Energy Planning Colloquium.

4. KEY POLICY QUESTIONS TO BE CONSIDERED

A critical element of the IEP is to provide recommendations on key policy issues facing the energy sector. While it is not possible to address all questions, key questions need to be identified.

Some of the Key Policy Questions that the IEP seeks to answer are as follows:

- Given current policies and legislation, what is the most optimal energy mix that will ensure South Africa achieves security of energy supply at the minimum cost to the economy, while simultaneously minimising emissions and water usage?
- What alternatives should be considered to best meet South Africa's future transportation needs?
- Assuming more people will be driving liquid fuelled automobiles, what is the best way of ensuring security of liquid fuel supply in the country?
- What impact will long-term transport policies to encourage modal shifts from road to rail and from single transit to mass transit have on future transportation technologies? What impact will this in turn have on future transport demand patterns and how should the energy sector respond?
- By how much and where in the production value chain can we introduce efficiency in the energy system?
- What are the possible impacts to the energy sector (choice of energy carriers, technology options and costs) of meeting the constraints for greenhouse gas emissions defined in the National Climate Change Response White Paper?
- What are the possible impacts (choice of energy carriers, technology options and costs) of the proposed Carbon Tax by National Treasury on the energy sector?
- To what extent do regulated Liquefied Petroleum Gas (LPG) prices have an impact on electricity consumption patterns?
- What are the most appropriate energy sources that could meet the demand for energy services of heating, cooking and lighting?

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