Executing the build programme

Introduction

Additional power stations, major power lines and substations are being constructed urgently to meet rising electricity demand in South Africa. The approved capacity expansion budget is R343 billion[1] up to 2013 and is expected to grow to more than a trillion rand by 2026. Ultimately Eskom will double its capacity to 80 000MW by 2026.

The budget, approved by the Eskom board and our shareholder, is designed to meet the challenges of electricity reliability and availability and is aligned with government's target of a 6% GDP growth between 2010 and 2014. We will now deliver an additional 16 304MW in generating capacity by 2017. Generation projects will take up 73% of the budget, with transmission investment accounting for another 13%. The rest of the budget will fund improvements to the distribution network and efforts to diversify our energy mix.

Integrated strategic electricity planning

The integrated strategic electricity planning (ISEP) process provides energy and demand forecasting for up to 20 years into the future. As part of this process, data is gathered on supply- and demand-side costs and performances. Then the mix of these options and the timing of their use are optimised to meet the load forecast with suitable reliability, taking into account risks and assessment criteria.

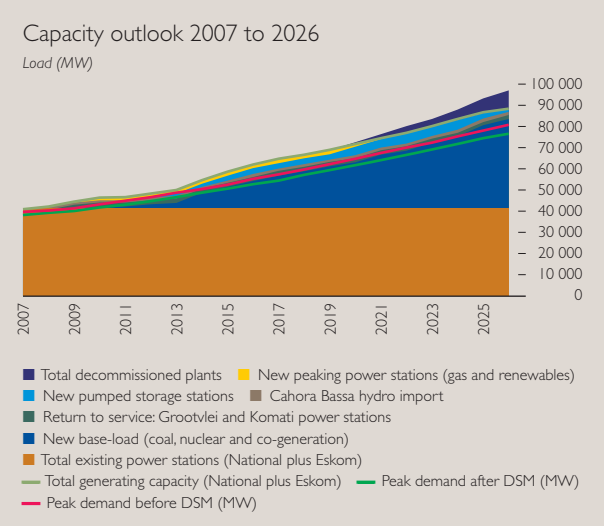
The planning process provides economically and environmentally acceptable options for flexible and timely decision-making, considering Eskom and our shareholder's objectives and taking into account available energy reserves and renewable energy potential.

The criteria for assessing the quality of the plan include cost, flexibility, robustness, sustainability and implementation.

For further discussion of criteria, please see www.eskom.co.za/annreport08/019.

While the major energy source will remain coal in the foreseeable future, we plan to reduce coal's current approximately 90% share of the energy mix to below 70% by 2026. To achieve this, a much higher proportion of nuclear energy (currently 4%) is envisaged by 2026, while additional renewable energy options (about 2% by 2026) will also be pursued. Pumped-storage and gas-turbine power stations will be built to meet peak demand, while electricity imports from neighbouring countries (to a maximum of the reserve margin) will also be negotiated.

[1] *This is nominal rand, and based on 2007 financial assumptions.*



Investment portfolio

The investment portfolio target ranges are updated and discussed by the board on an annual basis and were revised in December 2007.

The approved generation energy mix is based on the current strategic drivers, the integrated strategic electricity plan (ISEP), and the results of portfolio modelling. The key assumptions and sensitivities under which these portfolios will change relate to the demand forecast and the fuel cost of the different baseload technologies. Should demand not grow at 4%, significantly less capacity will be required. Changes in any key assumptions will lead to a change in the portfolio targets.

Strategic drivers such as climate change mitigation, diversification and shareholder aspirations must be balanced and traded off against purely financial considerations. Eskom also faces environmental challenges and primary energy constraints in the face of global competitive markets and a shortage of skills.

Since the build programme started in 2005, we have added 2 582MW to our fleet.

Based on committed projects, new options and investment strategy drivers, we recommend a portfolio that moves away from the least-cost option to incorporate a more "clean" and diversified portfolio that still reflects a reasonable "value at risk" and includes replacing existing coal-fired generation with clean coal technologies.

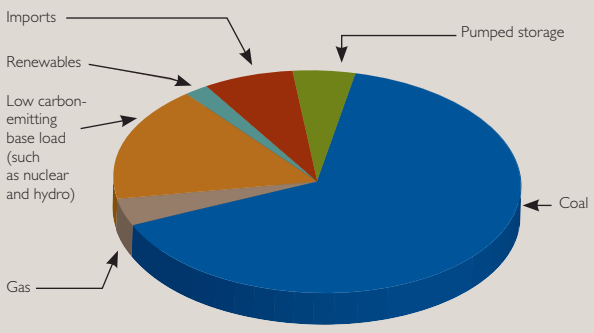
We are ensuring that not only are we complying with South African environmental, social and legal requirements, but also the Equator Principles, IFC[1] performance standards and taking into account the IFC Environmental Health and Safety (EHS) guidelines.

Refer to www.eskom.co.za/annreport08/020 for the strategic drivers taken into account when developing the portfolio.

The following portfolio ranges have been approved:

Generation mix	Target ranges
Coal-fired generation	<70%
Combined-cycle gas turbine	Only use for peak supply when needed
Low carbon-emitting base load (such as nuclear and hydro)	17% – 28%
Renewable energy	>2%
Imports	2% – 15%
Open-cycle gas turbine	Only use for peak supply when needed
Pumped storage	4% – 10%

Proposed generation mix



[1] *International Finance Corporation part of the World Bank Group.*

The sod turning for the new Medupi power station in Lephalale on 14 August 2007.

Build programme highlights and lowlights

The Eskom build programme is on track to deliver the projects as planned. Since the programme started in 2005, an additional 2 582MW has been commissioned.

The formal opening of both Ankerlig and Gourikwa power stations took place in October 2007 at Ankerlig. In May 2007, Nersa granted Eskom the licence to build the first new coal-fired power station in more than 20 years – Medupi power station in Lephalale, Limpopo Province. An official sod turning took place on 14 August 2007. In October 2007, Hitachi Power Africa was awarded the R20 billion boiler contract and Alstom S&E the R13 billion turbine contracts. More than 50% of the combined value of the contracts will be procured locally. Terracing work was started in May 2007. An independent assessment of the degree to which the Medupi power station and the associated environmental and social assessment and management approaches comply with the Equator Principles was undertaken.

In December 2007, Eskom awarded contracts worth about R31,5 billion for its "Bravo Project", a coal-fired power station to be built at Emalahleni in Mpumalanga by 2017. Hitachi Power Africa was awarded the R18,5 billion boiler contract and Alstom S&E the R13 billion turbine contract. Terracing work started in April 2008.

Eskom

Performance review continued

The return to service of the three mothballed coal-fired power stations – Camden, Komati and Grootvlei – has progressed well. The original planned target date of end October 2011 for commercial operation of all 23 units (3 800MW installed capacity) will be achieved.

Work is also progressing well on Ingula, a pumped-storage scheme near Ladysmith, KwaZulu-Natal, with an installed capacity of 1 352MW. The station is planned to be fully operational by the end of 2013.

The Apollo substation refurbishment is on track for completion by June 2008 and will increase the availability and maintainability of the Cahora Bassa-Apollo HVDC interconnection.

A team of more than 2 500 engineering, project management and commercial resources, supplemented by 19 local and foreign engineering and project management companies who are contracted as partners over the next five to 10 years, is actively involved in the execution of the build programme.

The capital expenditure (capex) incurred from 2005 to date on these projects is:

	2005/6 Rm	2007 Rm	**2008 Rm**	Cumulative Rm
Actual capex	4 820	8 226	**13 311**	**26 357**

Refer to www.eskom.co.za/annreport08/021 for a summary of all current projects under construction.

Refer to www.eskom.co.za/annreport08/022 for details of the HVDC (high-voltage, direct current) research programme.

Building a coal-fired power station

The building of a coal-fired power station is a lengthy and complicated process, involving a large number of factors influencing the final decision. The construction alone could take eight to 10 years.

1. Site selection

When it comes to deciding where to build a power station, the following factors (among others) are taken into account: availability and accessibility of coal and water, the ease with which the new station can be integrated into the national transmission network; environmental impacts of both the power station and the transmission lines; local area impacts, that is, the social and natural environmental impacts; and capital and operating costs.

2. Awarding of contracts

The civil works, boiler, turbine, auxiliary plants, electrical and control and instrumentation contracts form part of the main contracts in terms of which the larger construction work is performed. Many smaller companies are involved as subcontractors.

3. Site establishment

This phase deals with the provision of infrastructure for the main contractors to start work. Water and electrical supplies need to be installed, land levelled, roads built and construction offices established. The terrain needs to be fenced off.

4. Construction

Construction starts with the setting out and digging of foundations. Although a number of areas are under construction at the same time, the main areas are the foundations of the boiler house, turbine hall, cooling towers and chimneys. From site establishment and civil construction to the point where the first boiler and turbine could be commissioned takes approximately four years. The units are commissioned between nine and 12 months apart.

5. Commissioning

Auxiliary plant systems need to be commissioned first to provide the logistical support for boiler and turbine operation. These include water treatment, coal supply and ash handling, electrical supplies and the transmission network.

Safety checks and testing are done before any plant is commissioned. Plant areas commissioned are taken over by Eskom, although the contractor remains responsible for defects.

A team of more than 2 500 people is actively driving the build programme.

The tunnel at the new Ingula pumped storage scheme near Ladysmith.

Environmental impact assessments

The undertaking of environmental impact assessments (EIAs) plays a critical role in ensuring informed decision-making regarding Eskom's build programme. Most of Eskom's capacity expansion projects are listed activities in terms of legislation and, therefore, require an environmental authorisation before construction may start. This is obtained from the Department of Environmental Affairs and Tourism (DEAT). The EIA regulations require the assessment of alternatives, public participation, and for the public to be given the opportunity to appeal against decisions made by the authorities.

DEAT is assisting in fast-tracking the EIA studies of priority power-related projects, and is working on a guideline to identify and speed up the processes for strategically important developments.

Environmental impact assessment process

The environmental impact assessment process is informed and guided by the National Environmental Management Act, which prescribes that environmental management must place people and their needs at the forefront of its concern and serve their physical, psychological, developmental, cultural, and social interests equitably. Thus people's needs, concerns and issues cannot be disregarded or taken without due consideration during these processes. All stakeholders have the right to equal opportunity to raise their concerns and have them addressed. It is for this reason that time and money are normally regarded as secondary concerns in comparison to people and the environment. It is evident to all involved that, if not conducted properly, these processes have the ability to delay a project, result in litigation, and/or render a project unviable.

To secure an environmental authorisation, sufficient time and proper consultation with all major stakeholders and interested and affected parties are required. However, with the challenges facing the country, the time required is often a luxury we do not have and cannot afford. Thus, Eskom is continually under pressure to deliver the required infrastructure within constrained time frames. Eskom remains committed to quality EIAs and public engagement processes.

In South Africa, the undertaking of EIAs has been legislated as part of the project planning process. Eskom appoints independent (as defined in the legislation) consultants to undertake the EIA for our proposed build programme projects. Amendments are being made to the South African EIA-related legislation. Eskom has participated in the public-commenting process on the proposed amendments.

Link to Eskom EIAs: www.eskom.co.za/eias

Land and rights

Highlights

We have embarked on numerous strategically important EIAs with regard to land and servitude acquisitions for new power stations, substations and power lines throughout the country. The majority of these projects were successfully completed, as they were well received by the communities and the affected authorities.

In most cases the public is committed to taking part, voicing its views and influencing the outcome of each EIA and servitude acquisition process. This year alone, 8 155 interested and affected parties throughout the country were consulted and 584 servitudes were acquired.

Lowlights

- we regularly find that some stakeholders only begin participating late in the land or servitude acquisition process. It is frequently the case that the new perspectives and ideas require the review of decisions already made, setting back the process
- people buy properties where the seller has failed to disclose that Eskom has an approved record of decision to install a power line over their properties. Resolving these issues often delays the servitude acquisition process

Refer to www.eskom.co.za/annreport08/023 for more details on the land and servitude acquisition process.

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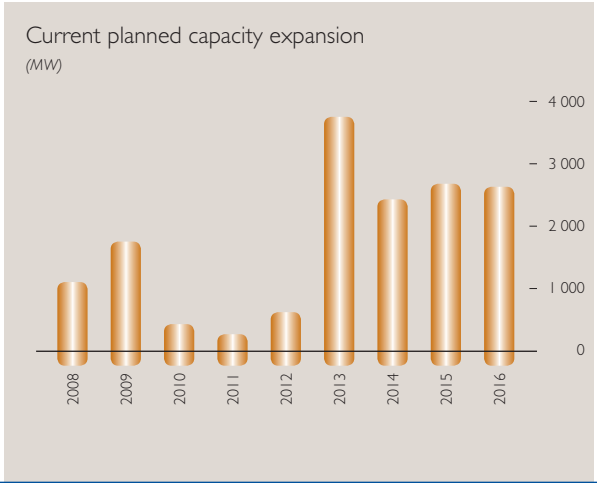
Performance review continued



Looking forward

Current planned capacity expansion (MW)

This table indicates the calendar years when new generation capacity is planned to be commissioned.

MW	**2008**	2009	2010	2011	2012	2013	2014	2015	2016	Total
Camden (coal-fired)[1]	**400**									400
Grootvlei (coal-fired)[1]	**590**	585								1 175
Komati (coal-fired)[1]	**120**	240	310	285						955
Ankerlig (OCGT)[2]		740								740
Gourikwa (OCGT)[2]		296								296
Arnot (coal-fired)[3]	**90**	60	30							180
Medupi (coal-fired)					798	1 596	798	1 596		4 788
Bravo (coal-fired)						803	1 606	803	1 606	4 818
Ingula (pumped-storage)						1 352				1 352
Lima (pumped-storage)								375	1 125	1 500
Wind farm (renewable)			100							100
Annual total MW	**1 200**	1 921	440	285	798	3 751	2 404	2 774	2 731	16 304

Co-generation programme

Pilot national co-generation programme

Eskom is running a pilot national co-generation programme (PNCP) to source co-generation capacity from the market.

Co-generation involves the use of unused waste heat, power, or resources by private companies to generate electricity. For example, "biomass" is a fuel that consists of cuttings left over after harvesting sugar cane or other agricultural waste. It can be burned in boilers to create steam to drive turbines and thus, generate electricity.

In October 2007, organisations were invited to submit tenders to take part in co-generation with Eskom. The potential bidders in the programme were given two opportunities to comment on the power purchase agreement (PPA) that would be offered under this programme, and a final PPA was released to the bidders on 20 March 2008.

[1] *Return-to-service power station.*
[2] *Open-cycle gas turbine.*
[3] *Capacity upgrade.*

The closing date for bid submissions for the pilot programme was 30 May 2008, and contracts should be awarded before the end of September 2008. Eskom received a positive response from interested parties.

Refer to www.eskom.co.za/annreport08/024 for more detail about co-generation.

Medium-term co-generation capacity project

While the PNCP process focused on procuring the maximum capacity in the shortest period of time, there are a number of third parties with potential generation projects that were not participating in the current co-generation process. To cater for these, the medium-term capacity project was proposed to access these potential generation projects, with a PPA for a term ending December 2018 and open to a wide variety of plant sizes and technologies. Eskom will consider proposals received up to 1 December 2008 and up to 3 000MW in size under this programme.

Refer to www.eskom.co.za/annreport08/025 for more detail about the medium-term co-generation project.

In 2007, Eskom invited tenders for the private sector to take part in co-generation.

Nuclear

With our plans to double our generation capacity, investigations are under way to determine the feasibility of some of this capacity being conventional nuclear power plant.

A strategic decision has been taken to remain with the pressurised water reactor family of reactors – similar to that which is used at Koeberg, but of the most recent design. Negotiations have started with two potential vendors, Westinghouse in the USA for the AP1000 design and Areva in France for the EPR design. The nuclear licensing process is anticipated to start during 2008, once the vendor has been selected.

The EIA for the first of the proposed nuclear power stations is being conducted on five sites that were previously identified, namely, Brazil (near Kleinzee) and Schulpfontein (near Hondeklip Bay) on the Northern Cape west coast, Duynefontein (Koeberg) and Bantamsklip (near Pearly Beach, east of Gans Bay) on the Western Cape coast, and Thyspunt (near Oyster Bay, west of Cape St Francis) on the Eastern Cape coast. The first of the proposed nuclear power plants is expected to have a capacity of approximately 3 500MW.

A draft scoping report has been released for public comment. Public open days and key stakeholder workshops were held in February/March 2008 to discuss the outcomes of the scoping phase. The detailed impact assessment phase will culminate in a draft environmental impact report to be released for public comment later in 2008.

The nuclear programme is subject to affordability and resource capacity.

Refer to www.eskom.co.za/annreport08/026 for details of the PBMR development project.

The new 132kV yard at the Medupi power station site.

Other projects

Other projects being explored:

- the DME is investigating the possibility of an independent power producer building a baseload (probably coal) station for completion before the new nuclear plant is in operation
- possible gas projects in Mozambique and Namibia
- the conversion of the current open-cycle gas turbines to closed-cycle gas turbines, which will increase capacity further
- following recent developments relating to engineering, procurement, and construction (EPC) issues, the owner of the coal resource in Botswana is revising its plans to develop phase one of the Mmamabula Energy Project, including alternative configurations for the power station project

Primary energy for new build

Extensive work has been done to secure adequate coal supplies of suitable quality for the Medupi and Bravo power stations.

Eskom is finalising an agreement with Exxaro Coal to supply the coal needed for all six units of Medupi power station for the first 40 years of its life. The success of these arrangements is based on Eskom's sound working relationship with Exxaro's Grootegeluk mine, which already supplies about 15 million tons of coal a year to the nearby Matimba power station.

Eskom

Performance review continued

Anglo Coal's New Largo coal mine has been earmarked as the main coal supplier to Bravo and is to be supplemented from smaller Anglo blocks at Zondagsfontein. The initial stages of the contracting process include further technical studies to determine how best to extract the maximum energy from the source while remaining within the bounds of the design of the boilers. Bravo's boilers are identical to those being installed at Medupi.

A highlight for both of these projects is that these boilers are of supercritical design, meaning that they will use some 6% less coal per unit generated than any of Eskom's existing power stations. This is due to increased operating temperature and pressure that result in improved thermal efficiencies. This is Eskom's initial move into a new phase in the application of emission-reduction technology.

It is envisaged that the coal supply agreement for Medupi power station will be finalised in 2008, and that for Project Bravo in the first half of 2009.

Underground coal gasification research

The underground coal gasification (UCG) pilot plant celebrated its first birthday on 20 January 2008. During the first year of operation, it produced more than 13 million cubic metres of gas, or enough to supply the heating and cooking requirements of 330 medium-sized houses.

Extensive monitoring of the environmental impact of operations has indicated no significant effects, but monitoring will continue to ensure that this remains the case.

While the output of the plant is presently fairly modest (100kW of electricity), the engineering, procurement, and construction of a demonstration plant are under way to increase the scale by some forty-fold. This will see sufficient gas produced for co-firing into Majuba power station's coal boilers and will prove the first gas production module.

The engineering, procurement, and construction of the demonstration plant are already under way, with plans to produce 70 000Nm^3/h by mid-2009. Following approvals, production will proceed to 125 000Nm^3/h by the end of 2009 and with approvals again to 625 000Nm^3/h by the end of 2010. This gas will be co-fired with coal at the existing Majuba power station, until approvals are received for a new 350MW UCG-integrated gasification combined-cycle (IGCC) ultra-high-efficiency power station, which could potentially be commissioned in the 2012 timeframe.

In parallel with the research and development phases, a motivation is being compiled for a new 2 400MW commercial power station, which will be proposed to Eskom and stakeholders.

An EIA has also been commissioned for this new concept. It is proposed that the new power station shares gas with the existing Majuba power station, so as to maintain UCG gas production flexibility.

Eskom's Corporate Services division is developing this project with UCG technology experts, Ergo Exergy Technologies Inc. (Canada), who are providing their proprietary eUCG technology.

Eskom's underground coal gasification demonstration plant in the foreground.

Refer to www.eskom.co.za/annreport08/027 for more detail on the underground coal gasification research.

Underground coal gasification shows great potential for the future.

Research

Performance

The Eskom research and innovation department (ERID) provides scientific and technical advice, research and consulting, analysis, detailed design as well as strategic technical planning services and direction.

The actual research expenditure was R156 million (2007: R203 million) while the expenditure on demonstration plants amounted to R93 million for the year, compared to R121 million in 2007.

Stakeholder comment:

Technology alone is not enough to solve future global energy challenges. Innovations in power production, delivery and utilisation can minimise the impact of ever-increasing demands for electricity. The Electric Power Research Institute's (EPRI) technology innovation programme establishes the framework for developing future technologies, looking inside and outside the power industry to advance its capabilities. Collaboration with scientists, engineers and companies worldwide, including Eskom, helps ensure that the industry will have the best technology to meet the energy demands of societies worldwide.

Clark W Gellings, PE
Vice President – Technology
Electric Power Research Institute

Additional units are being built at Gourikwa power station.

Forward-looking commitments

By working closely with the operational units, ERID is able to understand the organisational challenges and to pro-actively respond to find both short- and long-term solutions.

Given the current Eskom challenges, it was agreed that for the coming year, resources would be focused on:

- generation capacity, asset management and plant performance
- transmission capacity, asset management and plant performance
- distribution asset management and plant performance
- demand-side management and energy efficiency
- coal quality and coal combustion
- renewable energy sources
- climate change
- safety, health, social and environment
- accelerated development of the underground coal gasification project
- clean coal technologies
- HVDC (high voltage direct current lines)

Refer to www.eskom.co.za/annreport08/028 for further details of research activities.

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