



An overview:

Since its inception in 2004, the Integrated Demand Management (IDM) programme focused on influencing the electricity demand profile of its customers for the benefit of South Africa. Up to 2017, whilst Eskom experienced a supply shortfall, IDM focused mainly on energy usage reduction and energy efficiency. Currently a phase of relatively stable supply is being experienced and for certain hours of the day the country has operational reserves. As a result, the focus of IDM has changed, but the role it plays remains a vital mechanism to manage the electricity supply and demand balance. A multi-pronged energy management approach is used to achieve this.

Load profile optimization:

Irrespective of whether or not South Africa is in a period of operational excess or constrained supply, the system demand profile has a significant impact on the future supply requirements and the sources and cost of generation. The system load profile is becoming more “peaky”, resulting in high production cost during peak periods and low power station utilisation during the night. IDM provides financial incentives for customers to implement hard-wired technology solutions to shift demand from peak to off-peak periods. Not only do customers benefit from the incentives, but Eskom in the short-term reduces generation cost and in the long term postpones generation expansion, resulting in a mutually beneficial solution.

With the addition of significant volumes of renewable energy sources, specifically sun-based, Eskom now may have excess capacity around mid-day. New technologies and demand management programmes will shift load during this period and increase sales.

By introducing flexibility in optimising the system load profile and supporting an optimal future generation mix, IDM remains a key financial and operational driver for both sales growth and demand management.



Supporting Eskom's Growth Strategy:

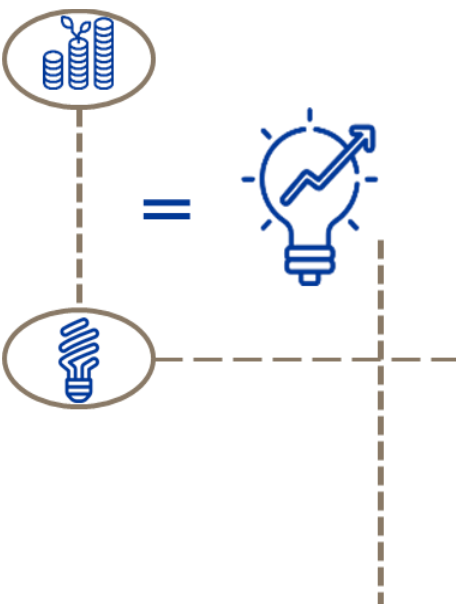
Eskom is again in a position to deliver on our mission to provide sustainable electricity solutions to grow the economy and improve the quality of life of the people in the Southern African region. The aim of the Growth and Innovation programme is to drive sales growth whilst diversifying Eskom's income streams. IDM, as part of a cross-organisational team, has developed an in-depth understanding of its customer base, their needs, electro technologies and pricing trends. IDM has a strong Product Development capability and has developed a suite of incentive schemes to support growth and sustainability strategy. These programmes and skills are being used as the base for new sales programmes. A number of programmes are under development - "The Offer Incentive Pilot Programme" has been implemented successfully – targeting 2.65TWh additional sales per annum for 2018 and 2019.

There is a strong drive for high load factor sales to mutually benefit both industry and Eskom's financial positions. However, this will only be possible if there is sufficient capacity during the peak period, ensuring uninterrupted supply. Load profile optimisation thus complements the growth drive – creating the space during peak, but mainly gaining from "filling the valleys". Additional sales, even at an incentivised rate will create an additional financial contribution that would not have been possible without such incentives. This additional contribution to Eskom's fixed cost will reduce the unit cost of producing electricity, ultimately to the benefit of the consumer as it will reduce pressure on future price increases.

The IDM product development capacity is used to develop specific market offerings in different market sectors to achieve the growth objectives. Based on detailed electricity cost and tariff structures and an understanding of customer cost structures, accurately priced market solutions assist in incentivising additional sales – examples of such solutions are "The Offer Incentive Pilot Programme" and the Boiler Incentive Pilot Programme.

Energy efficient growth:

IDM's focus has transitioned to support sustainable economic growth brought about by using energy efficient technologies that promote customer business expansion. Improving productivity and energy optimisation results in electricity sales and this in turn enables



positive investment decisions, not only to the benefit our customers, but also Eskom and the economy. Also, for Eskom “securing efficient sales of 90 units is better than an unsustainable 100 units”. Eskom will continue to advise customers on the efficient use of electricity.

Periods of energy shortage are cyclical. The drive for energy efficient sales growth will ensure that Eskom sustains the capacity to do energy efficiency, to be used in future times of system constraints. Energy efficiency also remains a key message in the low-income customer sectors.

Energy Services’ regional footprint:

IDM has a national footprint of energy advisors across the country. A large number of these experts were involved in Eskom’s previous sales drive in the late 90’s. They honed their skills to drive energy efficiency and demand management.

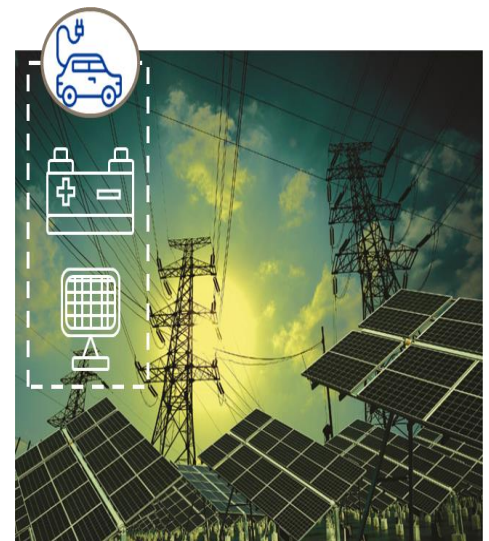
Eskom energy advisors work with both Eskom and municipal customers, influencing demand for electricity (up or down) to the benefit of all involved.

Having an IDM capacity that uses the principle of efficient energy as a means to support both excess and constrained supply situations is a considerable asset to the industry.

New market development:

Eskom is involved in a number of new technologies in the demand management environment, most notably storage. This provides Eskom the opportunities to manage peak loads, particularly on constrained, residential feeders. Development of such solutions to manage demand, in combination with renewable energy sources, provides not only additional sales opportunities, but also avoids capital expenditure that would have been spent on extending constrained networks. Renewable energy can satisfy a key customer requirement, without the need for the customer to set up his own generation capacity which will result in a loss of sales for Eskom.

In IDM’s effort to actively look at the application of electro technologies to drive energy efficiency, a key focus is fuel switching from fossil fuel based sources, particularly in the bulk transport sector. Examples include conveyor belt systems and road to rail technology, specifically in the Eskom coal supply chain.



Internal energy efficiency:

Eskom is one of the largest users of electricity in the country, particularly at its power stations. There are significant opportunities to optimise internal consumption.

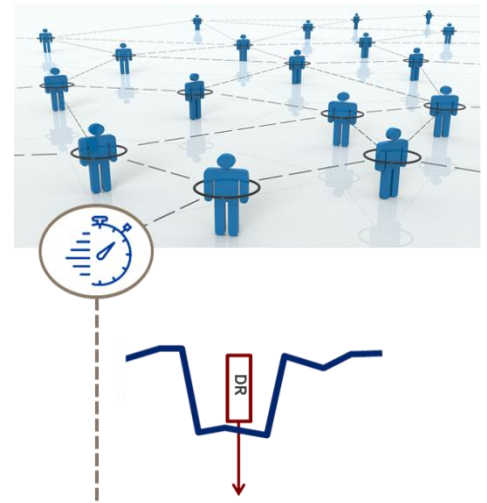
IDM is using the ISO50001 standard for internal energy resource efficiency in Eskom. At the same time a number of quick-hit opportunities have been defined to show immediate results. The concept of Performance Contracting, that was successfully applied in IDM, is used to partner with suppliers or project developers to replace inefficient Eskom plant and equipment e.g. transformers. This will avoid Eskom needing to invest capital and allowing the equipment to be funded through future savings.

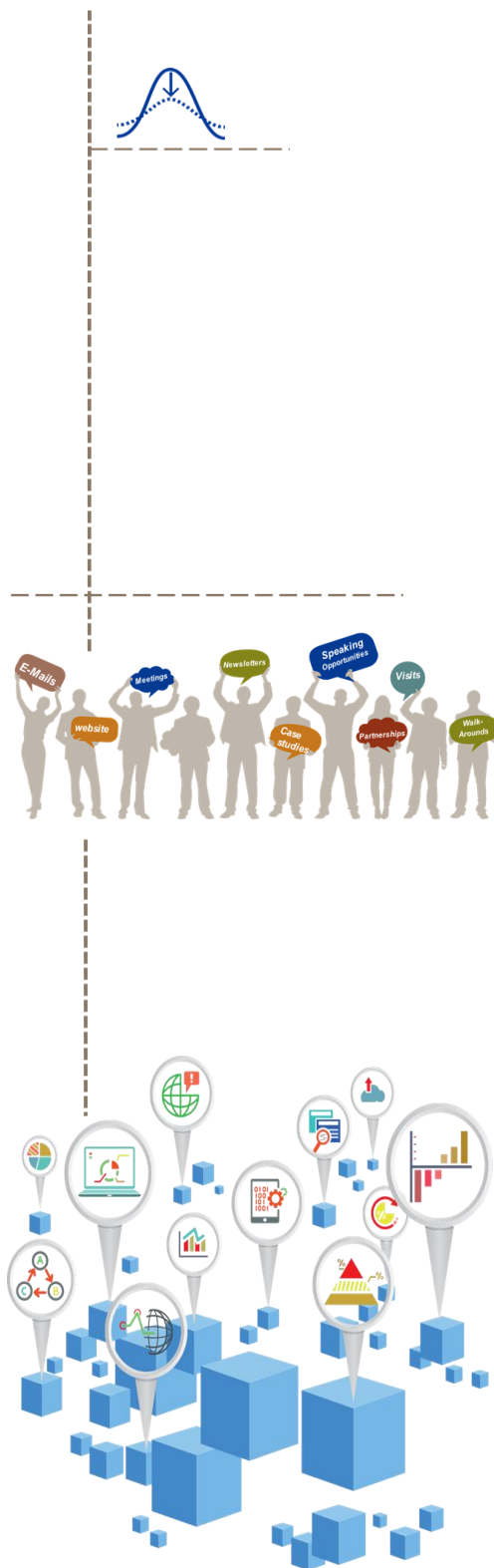


Demand response:

One of the main functions of the System Operator (SO) is to maintain the frequency of the integrated power system at 50Hz by keeping the supply and demand in balance. IDM supports the SO by providing demand response (DR) initiatives to maintain adequate operating reserve levels through the demand response programme. The SO achieves the desired balance by ensuring that a required amount of active power is kept available for this purpose. The SO also utilises demand-side initiatives to control frequency. The resources used for this are:

- **Instantaneous Reserve** – To achieve this, a consumer of electricity is contracted with, to drop a certain pre-determined amount of load, to counter act a fall in the system frequency. The purpose of Instantaneous Reserve is to keep the frequency at acceptable limits following contingency incident, for example a generator trip. The automatic action from the customer is to reduce load fully within 10 seconds and this must be sustained for at least 10 minutes. The system is more vulnerable in the late afternoon. The combined effect of the reducing generation capacity of the sun-based generation sources in the late afternoon and the sudden increase in demand in the evening has a large impact on the demand-supply balance. Instantaneous Demand Response is an ideal mechanism to manage this high demand period – if this balance becomes unstable; the contracted customers' load automatically reduces to alleviate the problem and restore balance.
- **Supplemental Reserves** - Supplemental Demand Response refers to customer loads that can be voluntarily reduced (for





compensation) by customers. Participating customers are required to reduce their load within a minimum notice period of 30 minutes, thus assisting Eskom to avoid using our expensive open cycle gas turbines. This mechanism is contracted with the customer annually and works on a bid available day-ahead. It is required to ensure an acceptable day-ahead risk, and to allow time for cold reserve plant to be started up.

Demand response as an economic dispatch or instantaneous response tool is an essential mechanism to any large electricity utility. The distinction between traditional demand response and load profile optimisation is becoming less pronounced, with IDM developing ranges of solutions, varying in customer needs in terms of response times and customer processes focus.

Marketing:

The IDM marketing aims to influence electricity consumption patterns for the benefit of Eskom, the customer and South Africa by promoting Eskom's multi-pronged energy management approach.

The current marketing focus is to develop marketing and communication strategies and packaging of the comprehensive solutions portfolio; promoting Eskom's internal programme and to educate consumers and learners on the value of electricity.

Conclusion:

Utility Integrated Demand Management is an international standard and critical utility function that manages to both reduce and increase demand, depending on the utility's system requirements at the time. Whether increasing demand or reducing it, it requires the same skills and expertise, the only difference is how it is applied. Fully harnessing this capacity renders Eskom agile and responsive to changes in the supply/demand balance, as experienced in 2018.

Load profile optimisation will continue to optimise the long-term generation cost through a flatter system load profile. Economic dispatch Demand Response will avoid expensive peak generation in the short term and Instantaneous Demand Response will protect an increasingly volatile system resulting from the high volumes of renewable supply sources being connected to the grid.

Leveraging IDM's product development and energy advisory capacity to partner with customers has shown impressive results, and will continue to contribute to Eskom's financial position and positively affect growth of the economy.