Eskom Integrated Demand Management: The Way Forward

Presented by:
Integrated Demand Management (IDM)

Date: November 2018
The 90s and early 2000s

Information and planning:
- Defined market segments
- Market information
- Customer information
- Market planning

Service:
- Sales advisors
- Call centre
- Energy audits
- EUE development
- Targeted programmes per sector

Logo:
- Symbol of quality
- Had a level of awareness
- Identity and vehicle to communicate with specific market segments

Targeted Programmes to encourage load shifting and additional sales

A Key Customer Relationship management approach, through Key Customer Account Executives, was adopted for Eskom Large Customers
From small beginnings to national challenges...

2004
- NERSA EEDSM policy agreed

2005
- Energy Efficiency Accord signed between big business and Minister of Energy
- Schools Programme launched

2006
- 1st Industrial project implemented
- 1st CFL mass rollout
- Western Cape Crises
- IDM measures (accelerated) effectively contribute to alleviate constraints
- Power Alert launched

2007
- National crisis
- IDM measures effectively contribute to alleviate constraints
- SWH programme launched
- DSM helpdesk started
- Financial constraint Funding uncertainty

2008
- Supply constraints
- DSM undertakes mass roll outs of CFLs in addition to ESCO initiated projects
- Accelerated DSM plan launched

Consumer physic: Blissful ignorance

Load shedding
IDM has demonstrated agility and resilience for more than a decade and had some fun along the way.

- **2010**
  - Standard Offer Programme launched
  - Residential mass rollout extending to high-end residential market offering a range of technologies
  - Renewable Energy pilot (10 MW)

- **2011**
  - Standard Product launched for small customers

- **2012**
  - Increased awareness levels
  - Continued focus on mass rollouts

- **2013**
  - Integrated Demand Management established

- **2014**
  - Severe financial uncertainty
  - Funding constraints (MYPD 3 decision)

- **2015**
  - Refocus on large-scale efficiency projects via ESCo model

- **2016 to 2018**
  - Additional Generation Capacity online

- **2009**
  - First smart metering pilots AMI and ULM
  - 917 MWs delivered in one year (6 times the annual NERSA policy target of 152 MW)

**Consumer physic:**

- Re-orientation
- Stability
Once implemented, energy efficiency interventions are in place for the duration of the technology life, allowing savings ‘capacity’ to be built over time. Since inception, IDM (DSM) initiatives have effectively displaced the equivalent capacity of an average power station in SA.

IDM cumulative capacity performance over time

Measured in MW

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003/04</td>
<td>1</td>
</tr>
<tr>
<td>2004/05</td>
<td>91</td>
</tr>
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</tr>
<tr>
<td>2016/17</td>
<td>4465</td>
</tr>
<tr>
<td>2017/18</td>
<td>4505</td>
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</tbody>
</table>

1 Power Station (6 x 600MW units)

Measured and Verified capacity savings as at Financial Year End 2018, provided by Integrated Demand Management PMO.
Strategic questions

• How do we manage the perceived conflict between optimised energy consumption and Eskom’s drive to increase sales?
• How do we motivate for investment in long-term benefits towards an optimal long-term system load profile in a financially constrained environment?
• What will renewable generation do to supply and demand balance and what can be done to mitigate the impact on the system?
• How can we make sure that we sustain the capacity to do energy efficiency? The balance in the demand and supply situation is cyclical and it will again be required in the future.
• How can the IDM solutions development skills be utilised to drive additional, efficient sales?
• How can we mitigate against an increasing residential peak and avoid impacting the economically productive sectors?
• How do we ensure that the IDM programme is robust and adaptable to sudden changes in the demand and supply balance?
• How do we influence NERSA’s perspective on the role of the IDM programme in managing the electricity system during excess capacity periods?
IDM focus depends on state of the system and the required response time

**IRP**

**Long Term** (7-20+ years)
- Sustain scalable EE and load shifting capability to support optimisation of system profile to minimise future generation cost in line with IRP

**Medium Term** (1-7 years)
- Energy Efficiency and Load Shifting programs to support medium term capacity shortfall
- Aggressive EE and Load Shifting to reduce peak demand
- Aggressive CFL replacements

**Annual plans**
- Load Shifting Programmes to optimise long-term system load profile and mitigate impact of renewables
- Economic Dispatch & Fast Frequency DR to stabilise system

**Immediate** (<24 hrs)
- Demand Response to Stabilise system
- Eskom Internal Energy Efficiency programmes in line with ISO 50001

**System Capacity**

**Constrained Network**
- Sales programs to drive “Efficient Electrification”
- Aggressive Sales Drive & customer interaction
- Fast Frequency DR to stabilise system

**Ideal**
- Customer advise on EE to ensure sustainability of revenues

**Excess Capacity**
- Aggressive EE and Load Shifting to support medium term capacity shortfall
- Aggressive CFL replacements
- Demand Response to Stabilise system

**Develop future markets and technologies for future sales (“efficient electrification”)**
IDM focus depends on state of the system and the required response time.

**IRP**
- **Long Term** (7-20+ years)
  - Sustain scale-able EE and load shifting capability to support optimisation of system profile to minimise future generation cost in line with IRP

**Medium Term Outlook**
- **Medium Term** (1-7 years)
  - Energy Efficiency and Load Shifting programs to support medium term capacity shortfall
  - Aggressive EE and Load Shifting to reduce peak demand
  - Aggressive CFL replacements

**Annual Plans**
- **Short Term** (<1 year)
  - Load Shifting Programmes to optimise long term system load profile and mitigate impact of renewables
  - Economic Dispatch & Fast Frequency DR to stabilise system

**Immediate**
- **Immediate** (<24 hrs)
  - Emergency DR to Stabilise system
  - Aggressive EE and Load Shifting for medium short term capacity
  - Aggressive Sales Drive & customer interaction
  - Customer advise on EE to ensure sustainability of revenues

Responsiveness to system capacity requirements
The current focus is to optimise the load profile to allow for additional baseload sales

**System load optimisation**

- Get customers to **shift load to off-peak**
- Reduction in the customer’s bill for using electricity in cheaper periods
- Optimise **long-term system profile** to reduce the long-term cost of Generation

**Demand**

- Use the space created from load optimisation to increase **high load factor (24/7) sales**
- Additional sales result in **recovering fixed cost and reduce cost per unit**

**Flexibility**

- Incentivise **customers to reduce demand** when system is constrained
- **Economic dispatch** to reduce OCGT cost
- **Fast frequency response** to protect the system to cope with increased renewables

Increase base sales and at the same time assist the System Operator to maintain a healthy demand-supply balance by changing customer usage profiles
Functional areas

**System load optimisation**
- Get customers to **shift load to off-peak**
- Optimise long-term system profile to reduce the long-term cost of Gx
- Peak load reduction of **>3600MW** achieved to date = 1 large power station

**Marketing**
- Market IDM programmes
- Schools education programme
- Real time system status reporting
- Media engagement and monitoring

**Expert advice**
- Advise customers on efficient use of electricity
- Drive **additional sales**
- Focus “**beyond the meter**”

**Solution development**
- Develop **Sales Products**
- Rebate programmes to increase sales
- Programmes to **unlock new connections**

**Demand response**
- Incentivise **large customers to reduce demand** when system is constrained
- **Economic dispatch** to reduce OCGT cost
- **Fast frequency response** to protect the system

**Energy efficiency**
- Large scale energy efficiency programmes when required
- Implemented **70 million CFLs**
- **Internal Energy Efficiency**

**IDM assists the System Operator to maintain a healthy demand-supply balance by changing customer usage profiles to support an optimal system load profile**
Eskom is pursuing a comprehensive solutions portfolio to stimulate economic growth

**Incentivise incremental sales**
Providing financial incentives for sales in addition to setting historical baseline consumption

- **The Offer:** Additional bulk sales incentive for ±150 largest industrial customers

- **Boiler Incentive:** Incentivise customers to switch from fossil fueled to electric boilers

**Unlock new connections**
Facilitating the process for customers to get connected to the network

- **Interruptible Supply:** Provide contracts on constrained networks
- **Manage Constrained Networks:** Relieve by installing PV / Battery Storage / DR
- **Self-Build:** Customers build own connection in shorter time and at less cost
- **Reduce “Punitive” Charge:** Allow paying off connection fees + reduce cost of deposits, tariff conversions and NMD changes

**Expert advice**
Providing technical support to facilitate additional use of electricity

- **Load Profile Optimisation:** to effectively use energy within available capacity
- **Alternative Funding:** Government incentives and grants can be leveraged to start new businesses
- **Energy Efficiency:** Incentives and grants can be leveraged for the establishment of new businesses and to stimulate economic activity

**Strategic initiatives**
Developing new market and technologies to sustain and increase future sale

- **Transport Electrification:** Promote conversion to electricity
- **Renewables:** Offer customer-based renewable solutions and green tariffs
- **Storage:** Provide storage in conjunction with renewables for security of supply and premium connections
- **System Optimisation:** Long-term load profile optimization to reduce future cost of supply
Combined effect of the reducing supply from PV systems in the late afternoons and the quick pick-up in peak demand leaves the system vulnerable for short period – Demand Response can assist in stabilising the system during this period.
Eskom’s Demand Response (DR) Programme, known as the Virtual Power Station (VPS), has been an integral part of the services employed by the System Operator (SO) to monitor, control and operate the national power network in a safe, economical and reliable manner since 2006. The Certified\(^1\) Demand Response Capacity offered by customers for rapid demand reduction has been significantly increased since 2010.

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**Note 1:** Certified capacity is the proven (on one or more occasions) capacity in MW that can be reduced and sustained by the participating customer.

**Note 2:** Includes instantaneous DR (892 MW) and supplemental DR (369 MW).
## Initiative:

### Emergency Demand Response
- Consider variable rates based on customer participation – frequency and duration

### Residential Demand Response
- Municipalities have ripple control systems to manage geyser load
- Munics benefit in terms of Eskom TOU tariff
- Partnering agreements with aggregators

### Aggressively expand Demand Response solutions to large customers
- Aggressive marketing of DR to large municipal customers
- Sign up municipal own load - compensation against outstanding debt

### Wider and/or deeper participation by Eskom Top 500 customers
- Increase volume of DR to current DR base
- Marketing focus on the customers within the Eskom Top 500 that do not participate in DR.

### Non-Dispatchable Demand Response
- Planned and scheduled Demand Response for fixed period and fix rates
**Solution: Alternate Funding**  
Government incentives/grants for businesses and economic growth

Five Government Tax Allowances (discounts on tax payable) and Grants (cost sharing non-refundable, tax-free cash payments) encourages growth in SA

<table>
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<th>Win-Win Partnerships:</th>
<th>Opportunities:</th>
<th>More Information:</th>
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| The Eskom **objective(s) when using the Incentives and Grants** are to inform customers who can potentially use this incentive to: | **12L Tax Allowance**  
Supporting businesses that use energy efficiently and invest in modern, energy efficient equipment | **SANEDI at 011 038 4300**  
**Internet search 12L Tax Allowance** |
| Establish **new operations or businesses** (Greenfields) with efficient electrical technologies and processes; | **12I Tax Allowance**  
Supporting Greenfields (new industrial projects that utilise new manufacturing assets) and Brownfields (expansions or upgrades of existing industrial projects) | **DTI at 012 394 1069**  
**Internet search 12I Tax Allowance** |
| **Expand existing operations** with more efficient electrical solutions; | **Critical Infrastructure Programme (CIP)**  
Supporting the construction of critical bulk infrastructure as a measure to stimulating investment and business growth | **DTI at 012 394 5827**  
**Internet search “Critical Infrastructure Programme”** |
| Convert from **other energy sources** to more efficient electrical solutions; and, | **Agro-Processing Support Scheme (APSS)**  
Supporting investment in businesses that specialise in agro-processing and agro-beneficiation | **DTI at 012 394 1618**  
**Internet search “Agro-processing Support Scheme”** |
| Install and use efficient technologies and processes to decrease electricity use **during specific times** of the day when electricity demand is high on the Eskom network. | **Aquaculture Development and Enhancement Programme (ADEP)**  
Supporting investment in businesses engaged in primary, secondary and ancillary aquaculture activities in both marine and freshwater environments | **DTI at 012 394 5815**  
**Internet search “Aquaculture Development and Enhancement Programme”** |
| **Specialist Consultants** available for support. | | |

**Grants and incentives are not administered by Eskom. Full details are available from the relevant organisations.**
Solution: The Offer Pilot Programme
Incentivised rates to large customers for additional electricity usage

The incentive will offer additional electricity usage to large customers at a lower effective rate, within the framework of existing tariff structures.

Concept principle(s):

Available to:

Benefits:

- Customers with ~100GWh/a consumption
- Eskom or Municipal customers
- 2-year commitment
- Increased usage of 25GWh per annum
- Available for a maximum of 500MW

An effective flat-rate enables even production schedules during all tariff periods.

The incentive rate will be lower than average rate currently paid.

Growth in electricity sales will reduce unit cost of electricity and curb future tariff increases.

Additional production, economic activity and job creation supports the national economy.

There is a need to move towards specialised pricing arrangements to target sales in specific economic sectors.
Electric mobility: Promote conversion to electricity-driven technologies

Electrical solutions for people transportation and bulk materials handling (conveyors, hybrid haulage trucks, electric rail networks) are increasingly cost competitive compared to conventional alternatives and considerably cleaner.

Eskom is supporting the national drive towards electric transportation in the interest of sustainability, localisation, efficiency and reduced reliance on imported fuels.

<table>
<thead>
<tr>
<th>Concept principle(s):</th>
<th>Of interest to:</th>
<th>Benefits:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E-mobility</strong> is globally gaining traction as a preferred mode of transport and materials handling.</td>
<td>Customers concerned with the total life cycle cost of vehicle ownership</td>
<td><strong>Lower carbon footprint</strong> resulting in lower carbon tax</td>
</tr>
<tr>
<td>The rise of <strong>low cost renewable energy</strong> and <strong>price and technology advances with batteries</strong> is contributing to rapid growth in this industry.</td>
<td>Materials handling where cost of liquid fuels is a concern</td>
<td><strong>No local air or noise pollution</strong></td>
</tr>
<tr>
<td><strong>EVs contribute storage capacity on the electricity network, complementing a diversified energy mix</strong> with a larger % of Variable Renewable Energy</td>
<td>Large vehicle fleet owners concerned with carbon tax</td>
<td><strong>Improved energy security</strong> due to a diversified energy mix (locally produced electricity vs imported fuel)</td>
</tr>
<tr>
<td></td>
<td>Cities interested in addressing air quality</td>
<td><strong>Very low maintenance costs</strong> due to fewer components</td>
</tr>
<tr>
<td></td>
<td><strong>Eskom offers expert advisory support</strong></td>
<td><strong>Economic benefit of lower fuel costs</strong> due to lower imports</td>
</tr>
</tbody>
</table>

Eskom is supporting the **national drive towards electric transportation** in the interest of sustainability, localisation, efficiency and reduced reliance on imported fuels.
The **self-build** option allows a business customer to build their own network connection

Offers customers the option to build their own electricity connection, using Eskom-approved contractors, service providers and suppliers, where they can deliver it more cost and time effectively.

**Concept principle(s):**

- **Eskom Build**
- **VS**
- **Customer Build**

**Available to:**

- Both existing and new customers
- Any business in the commercial, industrial and agricultural sectors
- All self-build project applications will be considered irrespective of the size of supply requested

**Benefits:**

- Customers are able to manage their electricity supply requirements more effectively
- Customers are able to control the timing and, to a greater extent, the cost of their connection(s)
- Gain faster access to an electricity connection
- Expedite production increases by switching on and powering new or expanded business operations sooner

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**Facilitating connectivity** to the national power grid is a measure to support an increase in productive output and stimulate economic growth.

**Note 1.** Go to [http://www.eskom.co.za/CustomerCare/NewSupply/Pages/SelfBuild.aspx](http://www.eskom.co.za/CustomerCare/NewSupply/Pages/SelfBuild.aspx) and [https://scot.eskom.co.za](https://scot.eskom.co.za) for further details and application forms.
Eskom’s commitment to implement energy efficiency in-house, is paying off

Eskom’s Internal Energy Efficiency Programme was initiated in 2009 with the objective of saving energy on non-essential load. More recently, the focus expanded to include all Eskom operations.

Past focus | non-essential load

- Target: 35 GWh by 2015
- Baseline reference year (236 GWh)
- 15% energy savings target
- Interventions include energy efficient water heating (SWH and heat pumps), lighting system retrofits and occupational sensors, energy efficient HVAC systems, new efficient lifts and escalators and solar PV installations.
- 27% savings already achieved
- Verified savings at December 2014 already delivered 65.78 GWh

Future focus | Eskom-wide

- Policy review to include all energy carriers and loads
- Strategy to achieve energy savings and reduce operational costs in all facilities and processes
- Energy management system to effectively manage and report savings

Achieving the same or more, with less energy use resulting in decrease in cost of supply, emissions and water consumption

Note 1. The 2009 – 2015 shareholder compact focused only on savings in Eskom non-essential loads. Non-essential energy consumption is defined as energy consumption that excludes energy in the thermodynamic cycle. It can further be explained as energy used in buildings, depots, service centers, etc.
Note 2. The intended approval process is as follows: Review and update the policy; approve strategy; implement strategy (engage leadership, create business unit work groups, identify opportunities, prioritise opportunities, investigate solutions, implement or fast-track quick hits, manage/adjust programme and report impacts.)
Regional energy services: Continuing with a strong marketing focus

We have ±65 Customer Advisors, geographically placed, engaging directly with the customers

<table>
<thead>
<tr>
<th>REGION</th>
<th>No. OF ADS</th>
</tr>
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<tbody>
<tr>
<td>Region 1</td>
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<tr>
<td>Region 2</td>
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<td>Region 3</td>
<td>3</td>
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<td>Region 4</td>
<td>4</td>
</tr>
<tr>
<td>Region 5</td>
<td>5</td>
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</table>

Energy services advisors offer a wealth of knowledge to Promote offerings to customers

MARKET FOCUS:
Commercial, industrial, mining and agricultural sectors

COST:
available at no charge

Equipped with a 7 module Energy Management Information Pack to guide the development and implementation of an energy management plan and measures

Advisors leverage off their Marketing and Branding experience during the Eskom growth phase in the 90s

Advisors use a set of Products, many with unique Pricing characteristic to drive additional sales

**Information & Planning:**
- Defined market segments
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- Customer Information
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**Service:**
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- Targeted programs per sector

**Logo:**
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- Had a level of awareness
- Identity and vehicle to communicate with specific market segments

**Incentive incremental sales**
Provide financial incentives to customers to reduce immediate baseline consumption

**Unlock new connections**
Facilitate the process for customers to get connected to the network

**Load Profile Optimization**
To effectively use energy when available capacity

**Alternate Funding**
Government incentives and grants can be leveraged for new businesses

**Storage Optimization**
Provide storage in conjunction with prerequisites for secure supply and premium connections

**System Optimization**
Long-term load profile optimization to reduce future cost of supply

A Key Customer Relationship management approach, through Key Customer Account Executives, was adopted for Eskom Large Customers
Looking Forward … Immediate Focus

- Driving **energy efficient sales** in support of economic development
- Developing **future electricity markets**
- Utilisation of **PV and battery storage** in market focussed solutions
- **Shifting of load** to optimise the long term system load profile and manage the impact of renewables
- Developing **Demand Response** solutions in the **residential** market
- More extensive, customer focussed **Demand Response Solutions**.