Investment Imperatives for Utilities to Ensure Sustainable Electrical Infrastructure Development

28 October 2008

Copyright © 2004 by NETGroup

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means — electronic, mechanical, photocopying, recording, or otherwise — without the permission of the NETGroup.

This document provides an outline of a presentation and is incomplete without the accompanying oral commentary and discussion.
Presentation Outline

1. Challenges to infrastructure Development,

2. The Current Reality,

3. Key Aspects of Infrastructure Planning,
   
   • Development Perspective / Demand Forecast & Network Development,
   • Ageing Equipment & Renewal Plans,
   • Developing a Sustainable Plan,

4. Conclusions,
Challenges to Infrastructure Development
Urban Development (Historic Growth / Age)

1890

1950

2008
Network Impact

1950

Network Renewal

2008

Network Load

Network Performance
Project Implementation Phases

- Reporting Stage: 6 – 12 Months
- Preliminary Design Stage: 2 – 4 Months
- Detail Design & Tender Stage: 6 – 12 Months
- Construction Stage (Contract Management): 1 – 3 Years

Service Area Size vs. Project Lead Time

- Distribution
- Transmission
- Generation
- Sub-transmission

4 November 2008
Strategic Site & Corridor Selection
Sustainable Development
The Current Reality
Current Reality (Operational Environment)

Approved Capital Program & Budget:
- Multi-year rolling plans / less than what is required / based on what can be achieved / lack of resources and experience

Procurement Process:
- Procurement committee time consuming and ineffective / Inadequate application of MFMA – / committees understanding / lead time to advertise and adjudicate,

Skills Development & Training:
- Entities under staffed / Lack of experienced Contractors. / Results in safety and quality / “Distribution Industry to promote itself”:

Theft of State-owned Assets:
- Theft of electrical infrastructure is on the increase / detrimental Effect / “Distribution Industry to actively get involved”: 
Infrastructure Planning Approach
Fundamental Planning Approach

Information Gathering & Review
- Geographical information
- Network Asset Information
- Standards, Criteria, Reports
- Investment and Refurbishment
- Load Forecast & Network Models
- Load (demand) data

Geospatial Load Forecast
- Land use study
- Demographic study
- Economic study
- Spatial forecast including:
  - Large and Small Power Users
  - Forecast Sensitivity Analysis

Strategic Environmental Assessment
- Assess Environmental consequences of the MP
- Formulate Alternatives
- Strategic Environmental Management Plan
- Allow participation of key: Stakeholders

Identify & Evaluate Investment Options
- Strategic Options
- Map alternatives
- Cost alternatives
- Zone substation & Feeder supply areas
- Network technical evaluation

Capital Program & Financial Evaluation
- Preferred Options
- Capital Expenditure Plan
- Financial Evaluation

Project Packages
- Geographical Presentation
- Functional Design
- Strategic Environmental Assessment
- Project Packages

High-Level Field Inspections
- Infrastructure review, High-level condition assessment
- Update general arrangement diagrams

Graphs and charts showing data trends and projections for 2005 to 2025.
Key Aspects of Infrastructure Planning

Development Perspective /
Demand Forecast & Network Development,
Developing a Sustainable Plan,
Ageing Equipment & Renewal Plans,
Demand Forecast & Network Development
Development & People Migration

1950

2008

2030
Economic & Demographic Assessment

Baseline Forecasting (BF)
- Population
- Economic Growth
- Historical Growth Rates
- Aids Studies
- Stats SA Estimates
- Population Growth Scenarios
- Economic growth scenarios
- Municipal documents
- Interviews

Development Database
- Location
- Land Use
- Operation date
- Size of project & growth in Household
- Probability of taking place
- Impact (Economic / Population)

Dynamic Forecasting
- Historic trends (BF) + impact of new developments (DD)

Interim Planning Population
- Spatial reallocation
- Vacant Land
- New Developments
- Densification
Load Categories / Characteristics

Categories
- Agricultural
- CBD
- Commercial
- Education
- Industrial
- Mining
- Open Space
- Services
- Small Holdings
- Vacant
- Residential

Sub Categories
- Intensity
  - Low
  - Normal
  - High
  - Ultra High
- Residential
  - Formal/Clusters
  - Density
  - Income
Geographical Load Forecast
Electrical Load Growth Perspective
Ageing Equipment & Renewal Plans
Ageing Equipment

1950

2008
Ageing / Performance & Capacity

Failure Rate / Performance

Life Expectancy & Capacity

- Distribution Transformer
- Switch

Maintenance Policy 1
Maintenance Policy 2

Asset Value
Initial Asset Value
Incremental Asset Value
Remaining Values
Life Extension

De-Rating that must be applied to provide expected 30-year remaining lifetime

Peak load can be no more than – Percent of Nominal
Time Already in Service

Asset Value

Maintenance Policy 1

Maintenance Policy 2

De-Rating that must be applied to provide expected 30-year remaining lifetime

Peak load can be no more than – Percent of Nominal
Time Already in Service
Planning for Renewal
Developing a Sustainable Plan
Strategic Environmental Assessment
(Typical SEA Structure)

Phase 1

Project Plan
Physical boundaries
Level of detail and Alternatives to be addressed

Scoping
Background Information
Stakeholder identification
Assumptions required

Situation Assessment
Data Collection & Verification
Specialist Assessment
Socio-Economic Assessment

Status Quo Report
Current Status
Opportunities & Constraints
Strategic Issues
Development Options
Sustainability Parameters

Phase 2

Public & Authority Review

Alternative Assessment
Evaluate Options
Stakeholder Workshop / Input

Strategic Planning Framework
Identify Strategic Development Zones
Set development guidelines, processes & action plans

Final SEA Document & Mapping
Strategic Environmental Assessment
(Geology, Ecology, Hydrology, Historical sites, Visual etc.)
SEA (Sensitivity Map)
Route and Site Investigation

For each line route and substation site:

1. Identify each land parcel,
   - Provide a schedule of owners with the following:
   - Identification of owner of each land parcel,
   - Contact details of owner,

2. Provide a map of the study area with all proposed roads and other services.
Funding Aspects
Utility Funding

Operational and capital investment costs,
Principle is to recover prudent cost,
  - Cross subsidisation of other services will impact on funds available for electricity services

Revenues through tariffs,
NERSA guidelines on % of revenue to be spent on maintenance and capital expenditure,
Operations funded through tariffs,
Capital investment funded from
  - Tariffs
  - Loans
  - Equity or grants

Shortage of funding will delay projects, creation of backlogs,
  - Where sufficient funds from tariffs is not possible, government will have to support with grants or guaranteeing loans

Appropriate funding mechanisms to be established as part of planning phase to ensure implementation of operational and investment plans.
Conclusions
Conclusion

Infrastructure development planning is key to Asset Management,

Infrastructure Planning to Integrate Strengthening, Renewal & Performance

Collective strategic view on infrastructure development is required within an electrical entity,

Strategic infrastructure planning cannot take place without adequate and accurate information, systems to evaluate and interpret trends and perspectives and skilled & motivated personnel to develop and implement strategies,

The current situation in SA requires leadership to bridge the technical skills gap, and to assist in establishing proper asset management strategies,

The success of tomorrow is based on best planning today,
Questions & Clarifications