Comparing the economic impacts of different modelling scenarios to cover the cost of producing electricity

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Outline of Presentation

• Background to the electricity situation
• The UPGEM modelling approach
• Economic effects of inadequate electricity infrastructure
• Research question
• Modelling scenarios
• Macro results
• Industry level results
• Recommendations
The Electricity Situation

- ESKOM needs to expand its capacity (supply) to deliver electricity across South Africa in order to facilitate projected economic growth (demand) → a large fixed cost must therefore be financed
- Basic electricity prices are too low at the moment and not reflective of the cost of production → electricity prices must rise in order for average revenue to equal average cost
- If electricity prices are not allowed to adjust it will require a much larger increase in electricity supply or a downward shift in the demand curve for electricity (relative to the baseline)
Modelling Approach

- Modelling evidence produced using the current version of UPGEM, a dynamic CGE model of the South African economy
- Based on the state-of-the-art MONASH model developed by the Centre of Policy Studies in Australia
- Economy-wide, substitution based on relative price changes, high level of analytical detail, sound theoretical mechanisms, flexible, familiarity and credibility from use in many projects and peer-reviewed publications

GDP Growth Scenarios

GDP Growth (Year-on-Year Percentage Change)

-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0


GDP Growth (Year-on-Year Percentage Change)

Standard Baseline  No ESKOM Growth
Household Consumption Scenarios

Household Consumption Growth (Y-o-Y Percentage Change)

- Standard Baseline
- No ESKOM Growth
Additional Capacity Required

Additional ESKOM Capacity Required with Low Electricity Prices (Cumulative Percentage Change)

- Required Growth in Electricity Output
What Does This Mean?

- There is no such thing as a free lunch
- Electricity output must rise to meet future growth in demand
- Electricity prices must also rise for production to become cost-reflective and reduce strain on additional expansion
- The previous slides provide us with clear evidence and motivation for achieving both these outcomes
- The question now becomes: What is the best way to generate the required additional revenue for ESKOM operations?
- Related questions regarding environmental impacts and the viability of alternative/renewable energy sources are addressed in a separate study
Modelling Scenarios

• Our main job was to analyze the different ways of achieving cost reflective production using the current UPGEM model

• Series 1: increase electricity tariff by 26%, 25% and 25% in 2013, 2014 and 2015 respectively and determine the change in government revenue and impact on the economy over time

• Series 2: VAT on households to fund expansion

• Series 3: VAT / tariff increase (4yr) combo to fund expansion

• Series 4: PIT, CIT to fund expansion

• Series 5: PIT, CIT / tariff increase (4yr) combo to fund expansion
Household Consumption

2x25%  VAT  3x18%+VAT  Tax  3x18%+Tax
Why Income Tax is the Worst Scenario
Explaining Industry Results

• The current version of UPGEM distinguishes 27 industries and commodities
• When interpreting industry level results from UPGEM we typically focus on three areas:
  – Shock (e.g. electricity is directly impacted on in these scenarios)
  – Macro link (e.g. construction is closely linked to I, mining to X and R/$, services to C)
  – Compositional effects (e.g. capital/labour ratios)
Macro trends influence industry results

![Graph showing trends](image_url)
Production factors and GDP

2x25%

x0gdexp  x1cap_i  emp_jobs
Construction Industry
Health & Social Industry
What Does This Mean?

• Raising electricity prices and revenues for ESKOM to become financially sustainable is unavoidable, but should be done in a socio-economic and politically sensitive manner.

• Our analysis suggests that directly raising electricity prices (over a period of 3 to 5 years) should be the main instrument towards achieving cost-reflective production of electricity.

• Series 1 and 3 shows a superior combination of macro and allocative efficiency outcomes in the economy.

• Users of electricity will therefore have to carry most of the burden of increased prices, although the impact of higher electricity prices will be felt throughout the entire economy.
Looking Ahead

• A lot more work could (and should) be done on building a more detailed industry level database and capturing the relevant mechanisms more accurately in the CGE model
• The parameters in the database should be carefully checked to ensure that both the economic literature and industry experts agree on their validity
Metal Machinery Industry

% change

Time

Series1 Series2 Series3 Series4 Series5
Radio TV Optical Industry

% change

Series1  Series2  Series3  Series4  Series5