Trade-offs in Zambia's Energy System: Identifying key drivers

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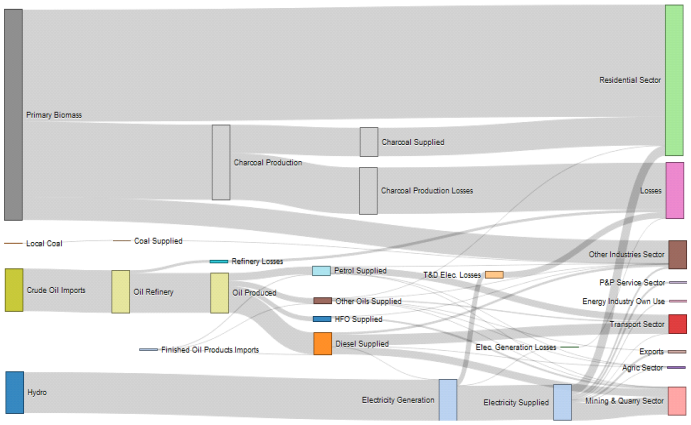
INTRODUCTION

- Zambia is one of the fastest growing African economies.
- There has been limited capital investment in the energy sector
- There is need to invest in the energy system in order to sustain economic growth.
- Access to clean energy is very low.
- Energy consumption contributes to deforestation.
- The hydro-power dominated electricity system is vulnerable to climate variability.

METHODS USED

- Scenario approach was used.
- Accounting and optimisation models were used to analyse different scenarios.
- LEAP was used to build the demand-side model.
- OSeMOSYS platform was to develop the supply-side model.
- The statistics used were from IEA, ERB and Zesco (energy regulator and public utility in Zambia respectively).

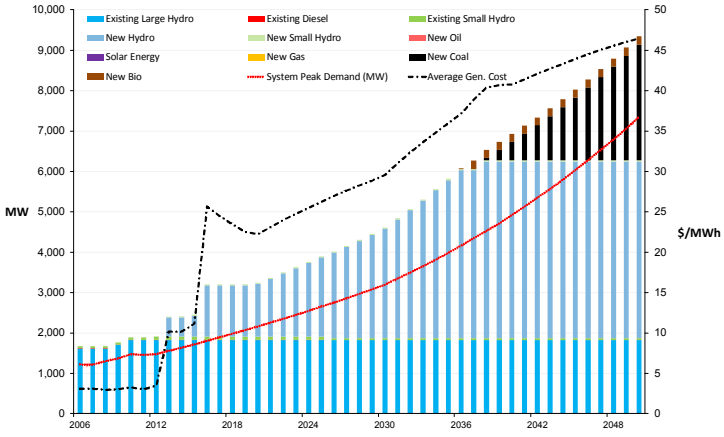
RESULTS AND DISCUSSION



Zambia's Energy Sankey Diagram for 2010

Base-Case Scenario Main Assumptions:

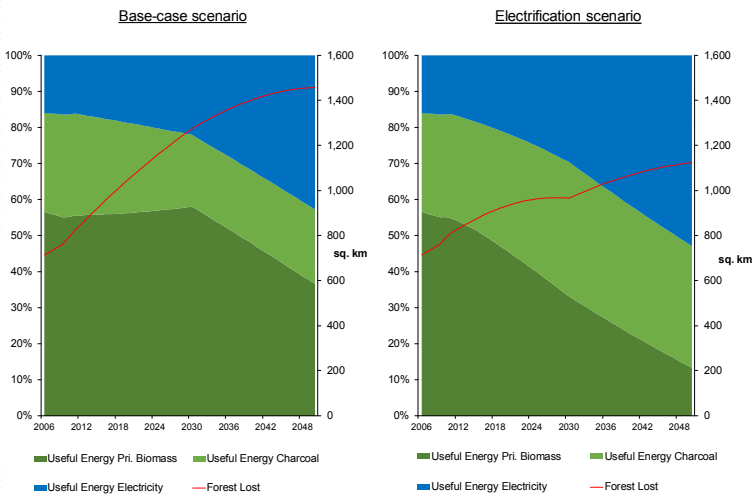
- National electricity access rate is 60% by 2050.
- Copper cathode production by 2050 is 2 million tonnes.
- Under the electrification scenario, electricity access rate is 87% by 2050.



Least Cost Capacity Requirement for electricity generation versus Average Generation Cost

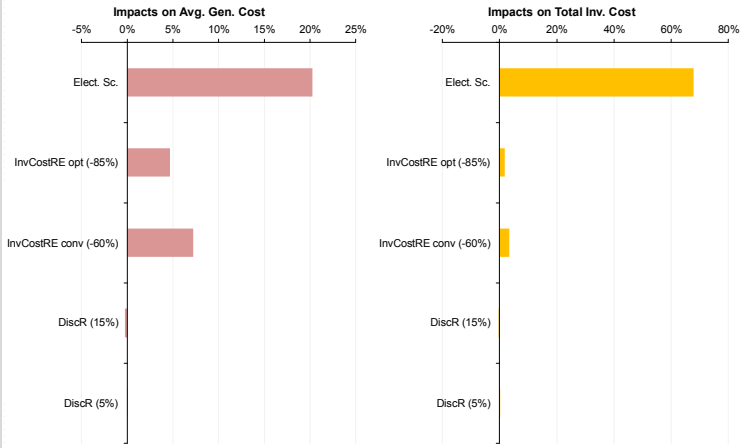
- The average generation cost increases because of increased capital investment in the electricity sub-sector.
- An equivalent of 3.5% of Zambia's Total GDP per year is required as capital investment.

- Electrification helps reduce deforestation.
- However, increased use of charcoal (switching from primary biomass) causes more deforestation.



Fuel-switching and deforestation

- The system is sensitive to the energy demand and cost of renewable technologies.
- The impact of discount rate in the Zambia system is minimal.



Sensitivity Analysis - Relative impacts of varying systems variables

FURTHER WORK

- Include fluctuations in river-flow due to climate variability and projected climate change patterns in the Southern Africa region.
- Disaggregate the Transport sector demand by taking into account the transportation mode shifts.
- Analyse the impacts that changes in projected energy prices will have on the growth of the economy.

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