



THE ZAMBIAN POWER SYSTEM AND ISSUES CONFRONTING THE ERB

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Electricity

SOURCES OF ELECTRICAL ENERGY IN ZAMBIA

- Predominantly hydro (approx. 96%)
- Remaining capacity various thermal
 - Diesel based Gas Turbine Alternators (emergency and peak lopping)
 - Conventional diesel cycle (islanded remote areas)
 - Waste steam (“peak lopping”)
 - Others (bagass)
 - Solar PV systems, wind others...

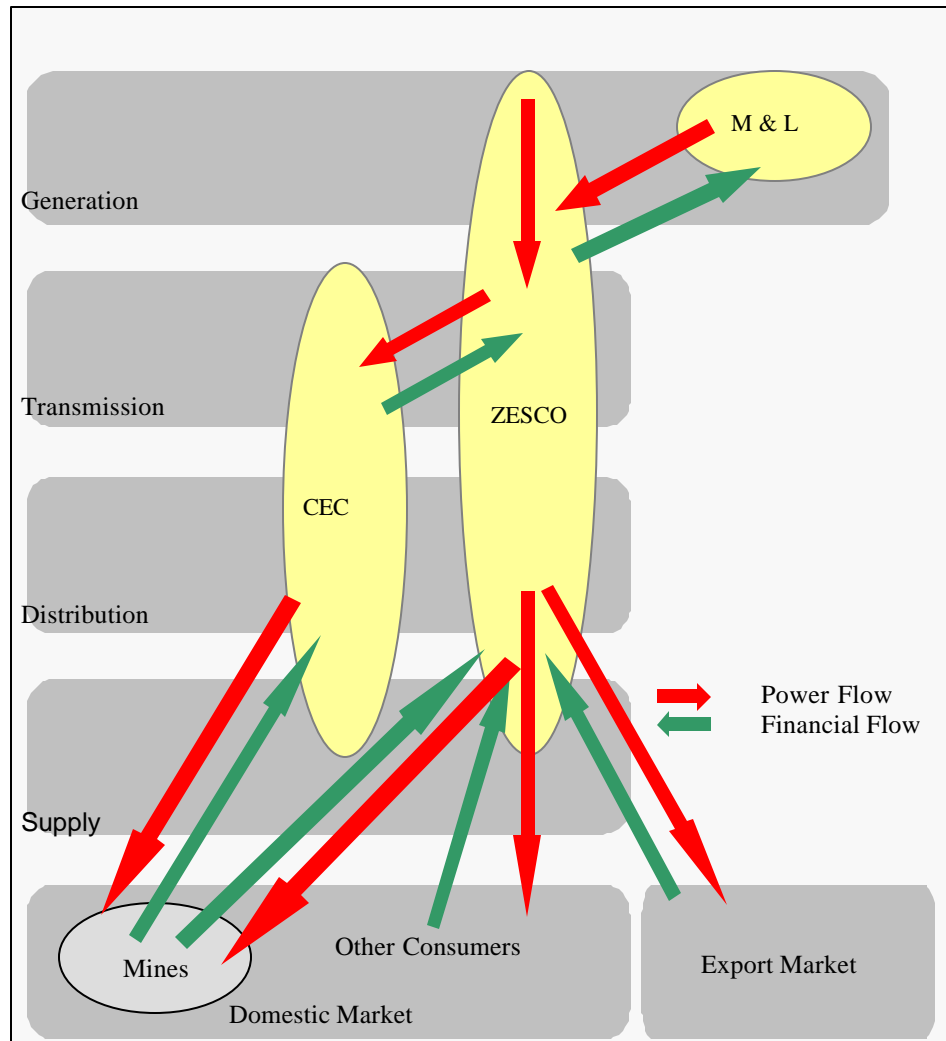
PLAYERS IN THE ZAMBIAN POWER MARKET

- ZESCO (vertically integrated state owned utility)
- Copperbelt Energy Corporation (transmission/distribution company supplying mines on Copperbelt)
- Lunsemfwa Hydro Power Company (hydro generation in the Central Province)

Customers

- Copper mines on Copperbelt and North Western Province
- Other retail (Commercial, domestic etc.)

STRUCTURE OF ZAMBIA POWER MARKET



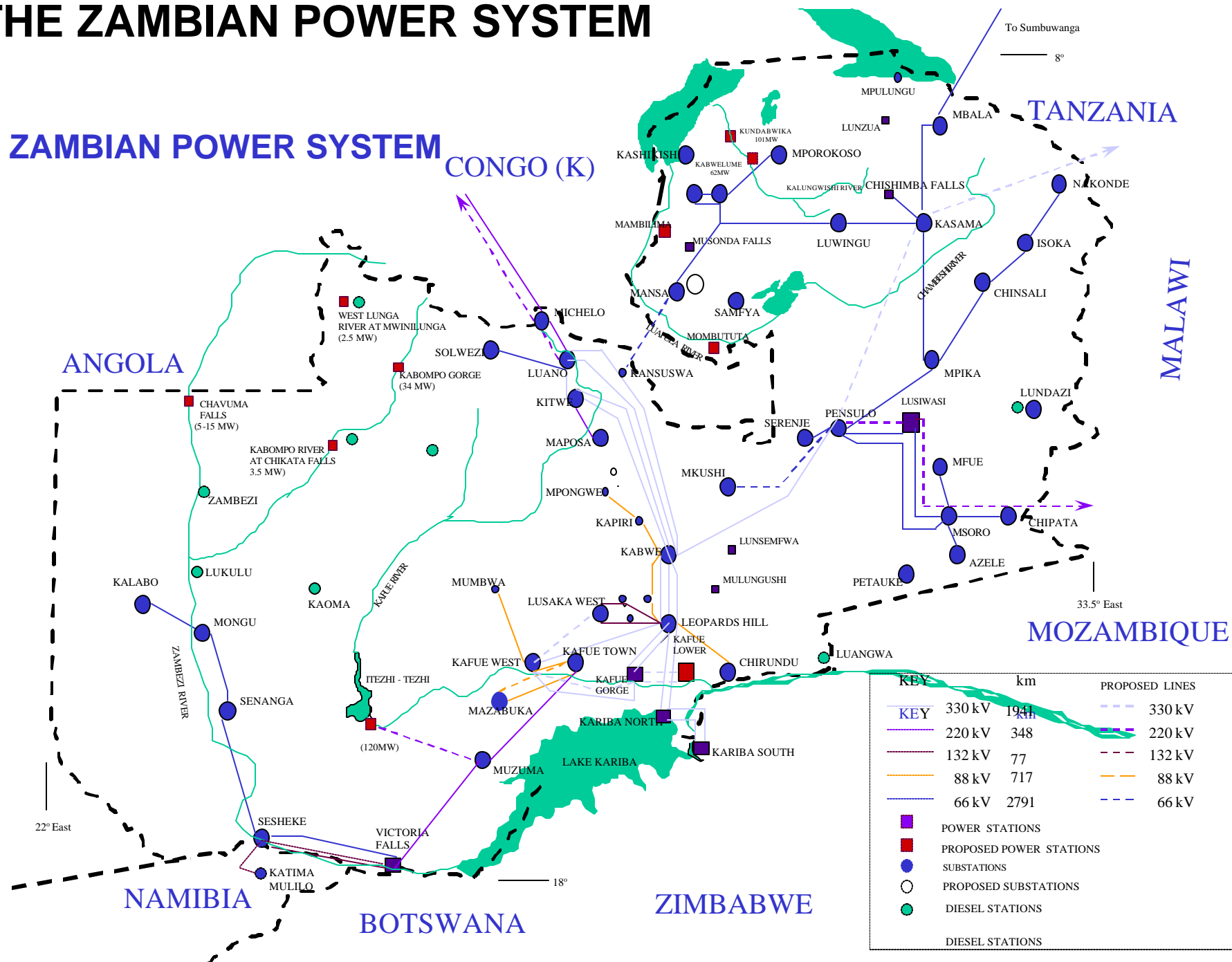
GENERATION CAPACITY

- ZESCO
 - Large Hydro (1608MW) 3 sites
 - Mini Hydro (23.75MW) 4 sites
 - Conv. Diesel (8.585MW) 10 sites
- CEC
 - Diesel GTAs (80MW) 4 sites
- Lunsemfwa Hydro Power
 - “Medium” Hydro (38MW) 2 sites
- KCM
 - Waste steam (20MW) 1 site
- Total: Approx. 1780MW

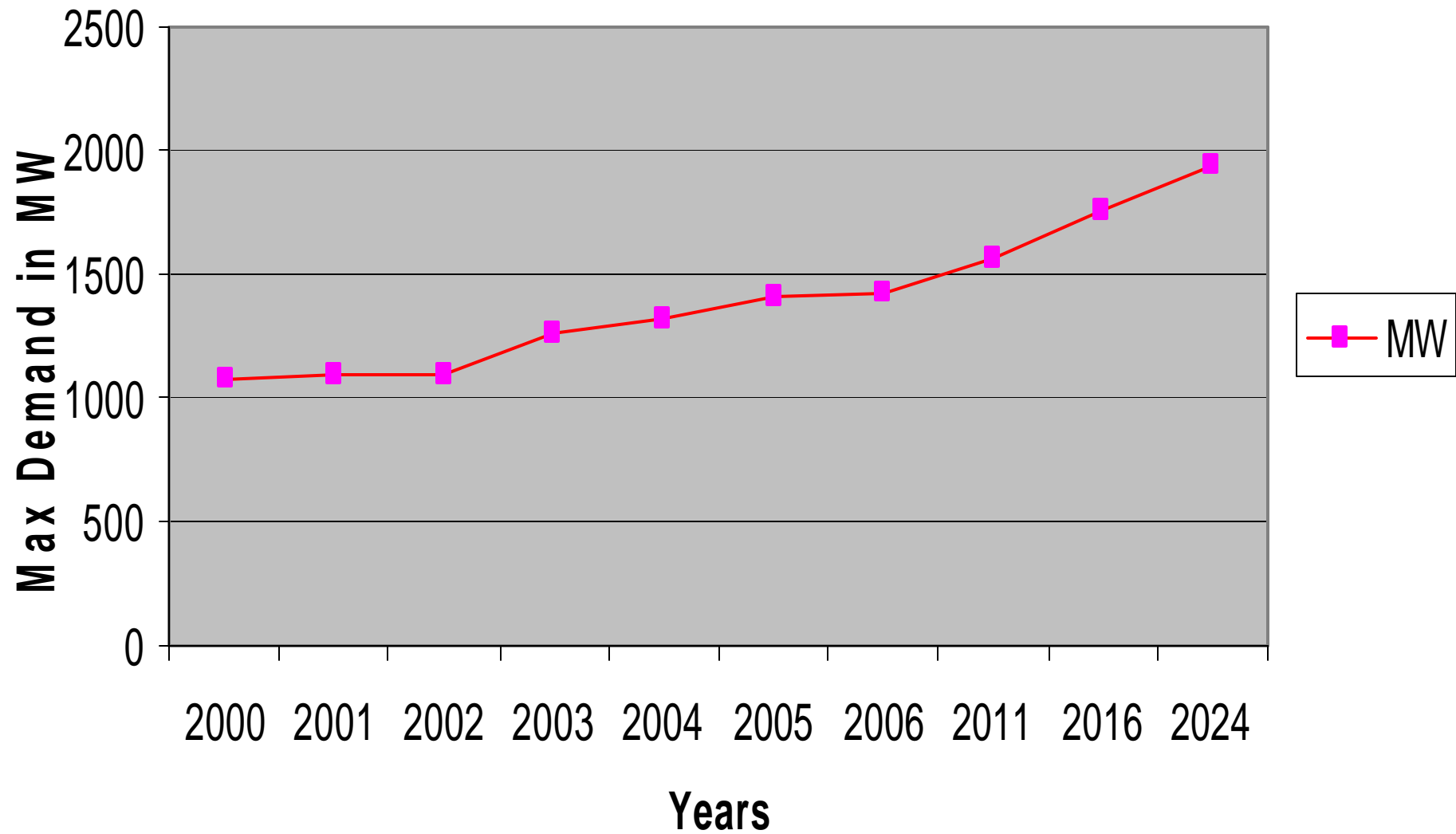
GROSS CONSUMPTION

- ENERGY – 7.88GWh (2003/04)
- MAXIMUM DEMAND – 1255.2MW
(Recorded June 2003)
- Maximum Demand Growth in 2003/04 – 12.3%

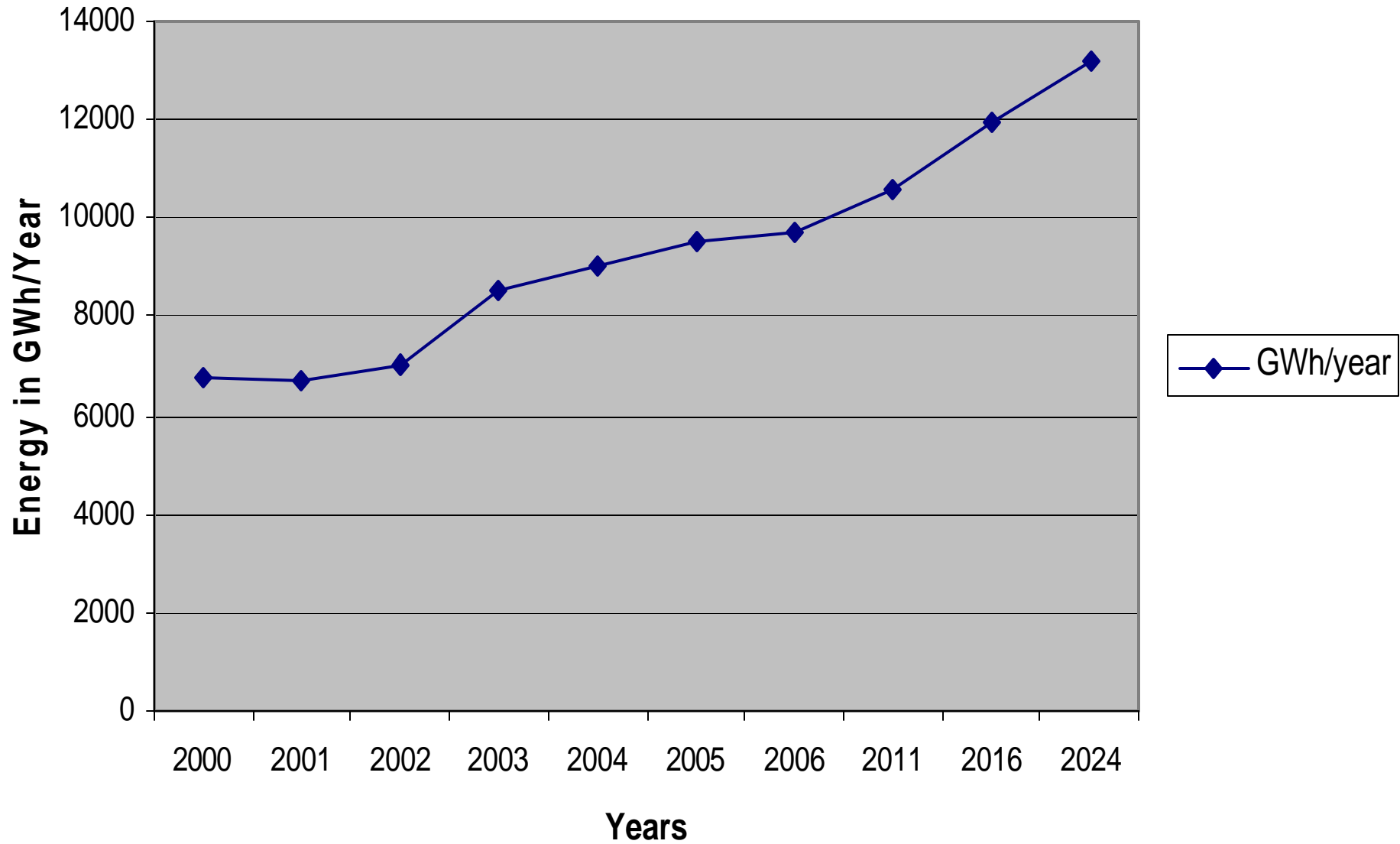
THE ZAMBIAN POWER SYSTEM



Demand Forecasts for Zambia



Energy Forecast for Zambia



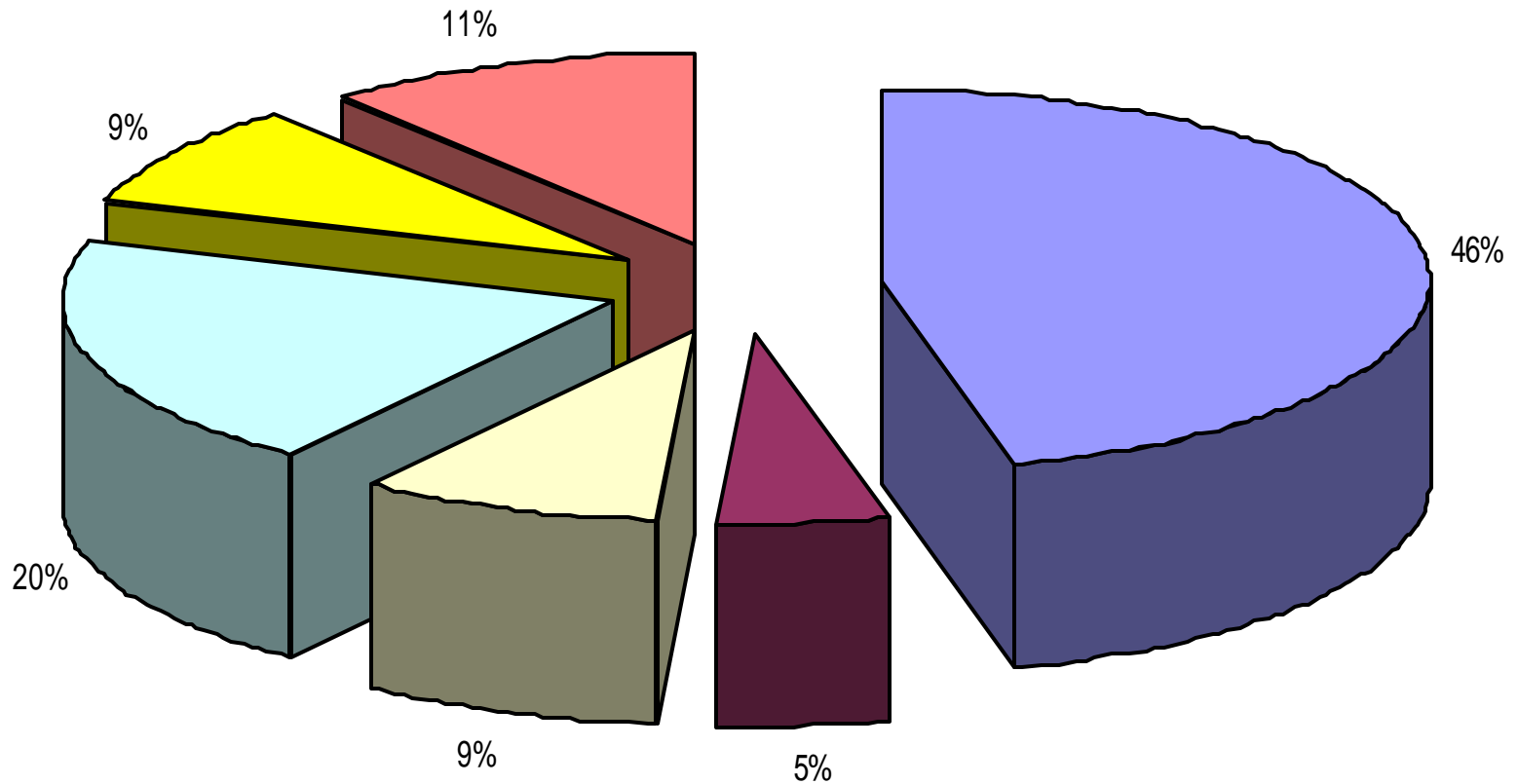
THE ISSUES

- Current electricity coverage is very low 22%
- Rural electrification initiatives being fast tracked through Rural Electrification Agency
- Local demand / consumption growth expected to continue being strong
- Capacity and energy to run out in next few years
- Significant amount of capacity tied to long term BSA between ZESCO and CEC
- Entire Southern African region faced with similar pressures

REMEDIES ?

- Restructuring
 - New investments
 - Generation
 - Transmission
 - Distribution
 - Supply
- Regional market
 - Interconnections

CONSUMPTION SPLIT



■ CEC ■ EXPORT ■ SOUTH ■ LUSAKA ■ NORTH ■ COPPERBELT

RESTRUCTURING INITIATIVES (1)

- 1994 – Promulgation of the National Energy Policy
- Policy measures of the NEP
 - Restructuring of the electricity industry
 - Improving accessibility to electricity
 - Electrification of productive areas
 - Developing hydro power generating potential

RESTRUCTURING INITIATIVES (2)

- 1995 – Enactment of Electricity Act and Energy Regulation Act
 - Abolished statutory monopoly of ZESCO
 - Allowed establishment of other electricity utilities
 - Established independent regulator of the energy sector – ERB

ERB LED RESTRUCTURING PROPOSAL

- 1999 – ERB proposed to government that a forum be formed to develop electricity market restructuring proposal
- Government accepted the formation of the forum
- Process carried out through stakeholder consultation

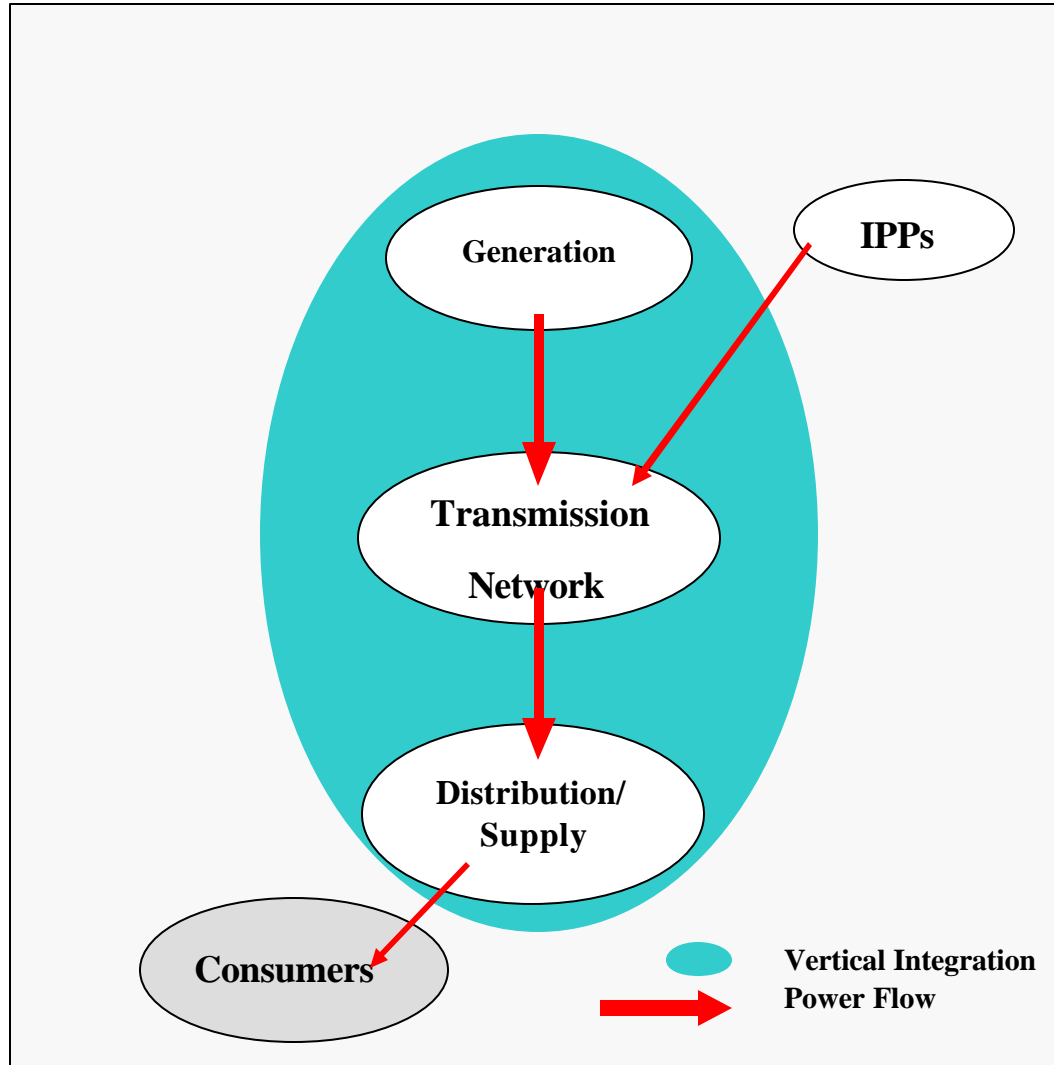
OBJECTIVES OF THE ERB LED PROCESS

- Increase access to electricity by majority Zambians
- Promote private sector participation
- Increase competition in the electricity market
- Improve efficiency in the electricity industry

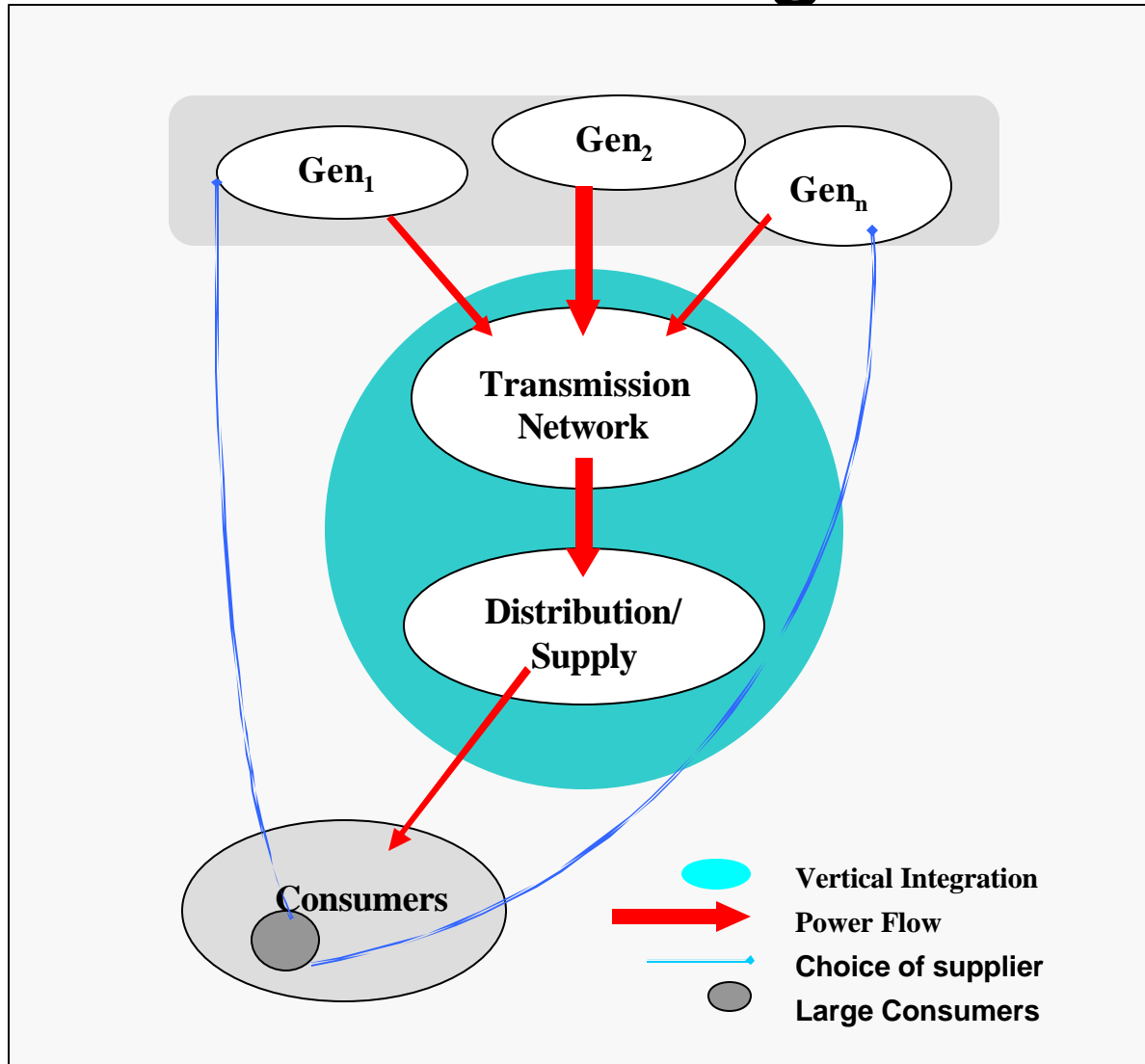
MODELS CONSIDERED

- Model 1 – Vertical Integration with IPPs
- Model 2 – Partial Unbundling
- Model 3 – Semi-competitive model
- Model 4 – Full Retail competition

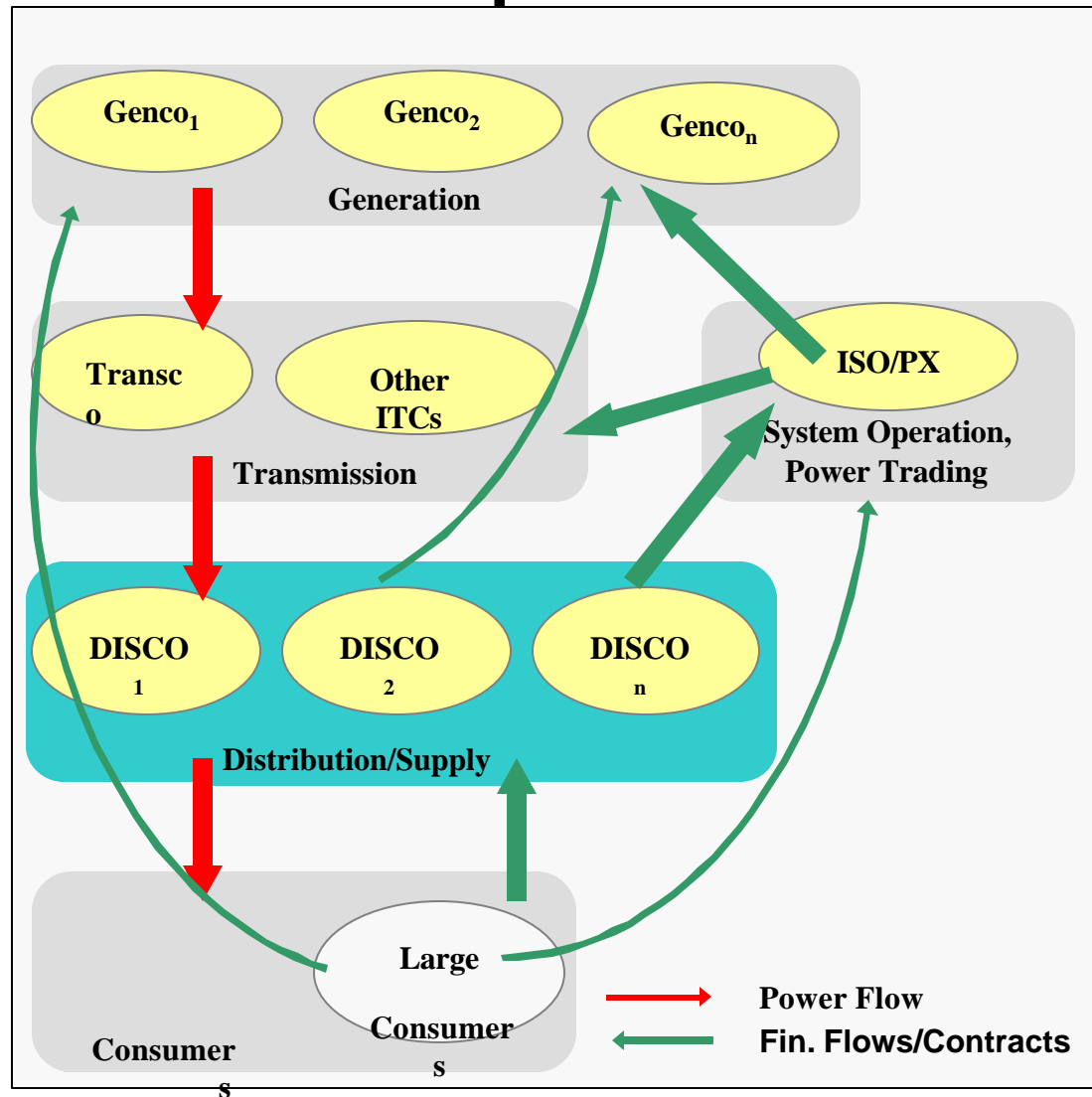
MODEL 1 – Vertical Integration with IPPs



MODEL 2 – Partial Unbundling



MODEL 3 – Wholesale Competition



MODEL 4 – Full Retail Competition

- Similar to the semi competitive model
- But allows choice for all retail consumers

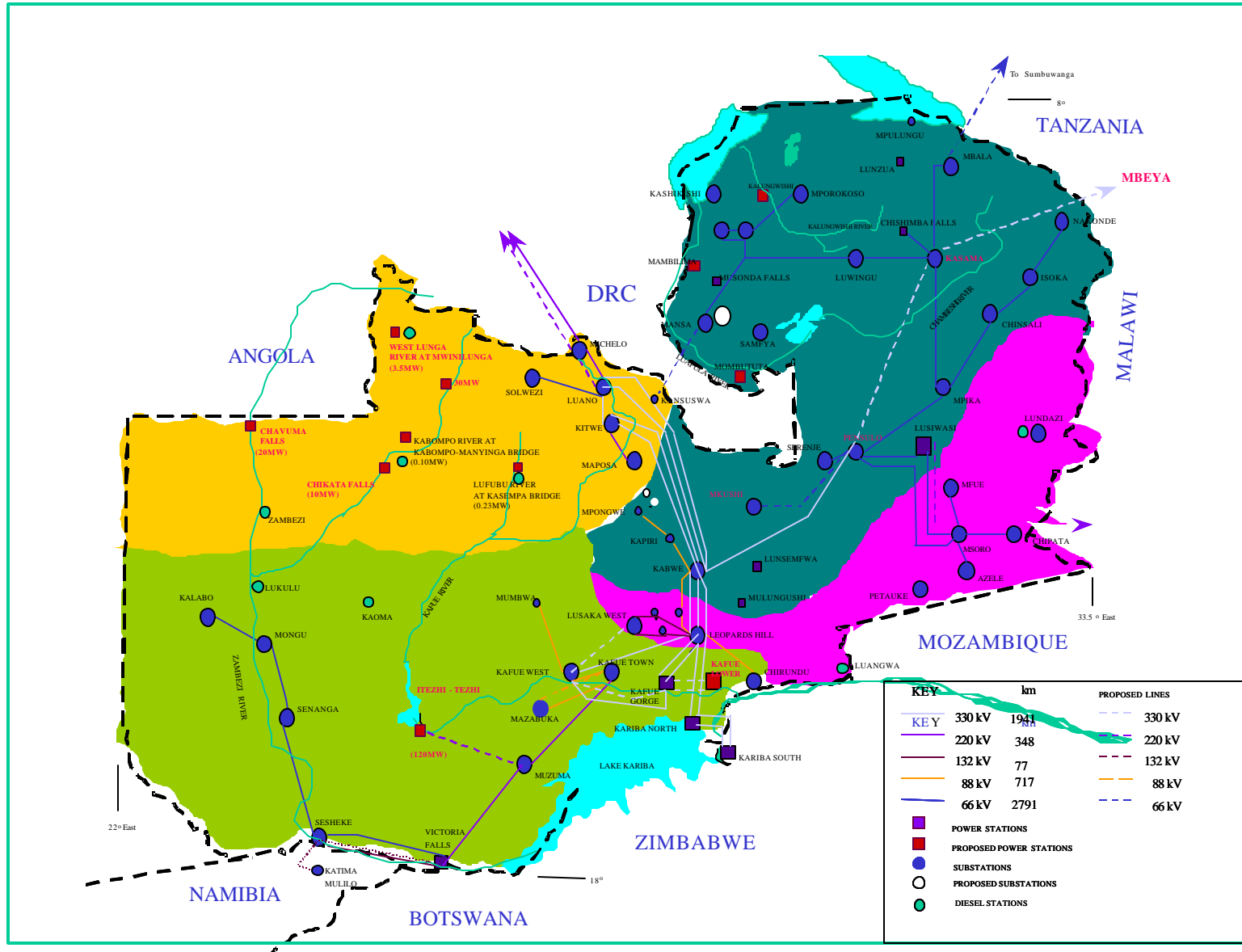
RECOMMENDED MODEL

- Model 3 recommended as preferred model for restructuring the Zambian electricity market
 - Vertical separation of G, T and D&S
 - Horizontal separation allowed at all three levels
 - T & D networks common carrier and open access

RECOMMENDED MODEL

- Allows for an Independent System Operator
- Market would be mainly contract based (among GENCOs, DISCOs and Large consumers) – wholesale competition
- Limited pool for short-term power trade – Power Exchange
- Officially presented to GRZ in Nov. 2003

DISCO CONFIGURATION



PRIVATISATION

- In 2000 Zambia Privatisation Agency (ZPA) hired US firm NEXANT to carry study on
“Options for Private Sector Participation in ZESCO”
- Three out of six options given detailed consideration

OPTION 1: Single Concession

- Concessioneering of ZESCO as vertically integrated
- Functional unbundling into generation, transmission, distribution and supply
- Concessionaire would pay upfront sum + annual fees
- Ten (10) year exclusivity

OPTION 2: Unbundling into corporate business entities

- Generation, Transmission and Distribution & Supply become three separate commercial entities
- Generation (70% private sector, 5% ZESCO employees, 25% GRZ)
- Small hydro power stations to local investors
- Later concessioning of transmission and distribution & supply
- ZESCO Holdings + three subsidiaries

OPTION 4: Master Concession

- Similar to option 2 but with master concession of ZESCO Holdings for no less than 10 years
- Thereafter business units can be hived off on outright sale or concession basis
- Negative concession for rural electrification
- **The recommended model**

WHERE ARE WE?

- Politically privatisation has left a bad taste in the mouth
- In 2003 it was argued that:
 - The size of the Zambian market too small for unbundling
 - Unbundling is encumbered by the BSA that commits a significant amount of power to one customer
 - Due to poverty Zambian consumers were unable to afford economic tariffs as a concessionaire would demand
 - ZESCO in current form is vehicle for rural electrification
 - ZESCO is significant earner of FOREX and contributes to national treasury

WHERE ARE WE? (2)

- Cabinet in 2003 therefore opted for the commercialisation of ZESCO as opposed to concessioning
- Objectives:
 - ☐ Improved financial performance
 - ☐ Improved quality of service
 - ☐ Attraction of new investment
 - ☐ Increase access
 - ☐ Introduction of new technologies in the company

WHERE ARE WE? (3)

- Current GRZ efforts focussed on the commercialisation of ZESCO
- Meanwhile in 2004 GRZ commenced National Energy Policy Review.
- Progress / decision on the ERB restructuring proposals awaits promulgation of new Energy Policy.

GENERATION DEVELOPMENT

- Studies show that hydro electric generation potential in Zambia is approx. 6,000MW
- Of the 6,000MW only 1,700MW developed
- With envisaged capacity and energy shortages it is increasingly important that new projects be brought on stream

Potential Projects

Site	Estimated Capacity (MW)	Estimated Cost (US\$million)
Lusiwasi Extension	40	92
Mpata Gorge	320	770
Luapula River **	950	1305
Kalungwishi *	163	210

Potential Projects

Site	Estimated Capacity (MW)	Estimated Cost (US\$million)
Kariba North Bank Extension	360	300
Itezhi-Tezhi	120	117
Kafue Gorge Lower	750	750
Batoka Gorge	800	860
Devil's Gorge	800	1430

Potential Projects

Site	Estimated Capacity (MW)	Estimated Cost (US\$million)
Kabompo Gorge	34	78
Chavuma	15.0	20
West Lunga	2.5	7.2
Chikata	3.5	13.1
TOTAL	4,358.0	5,952.30

PROJECTS UNDER ACTIVE CONSIDERATION

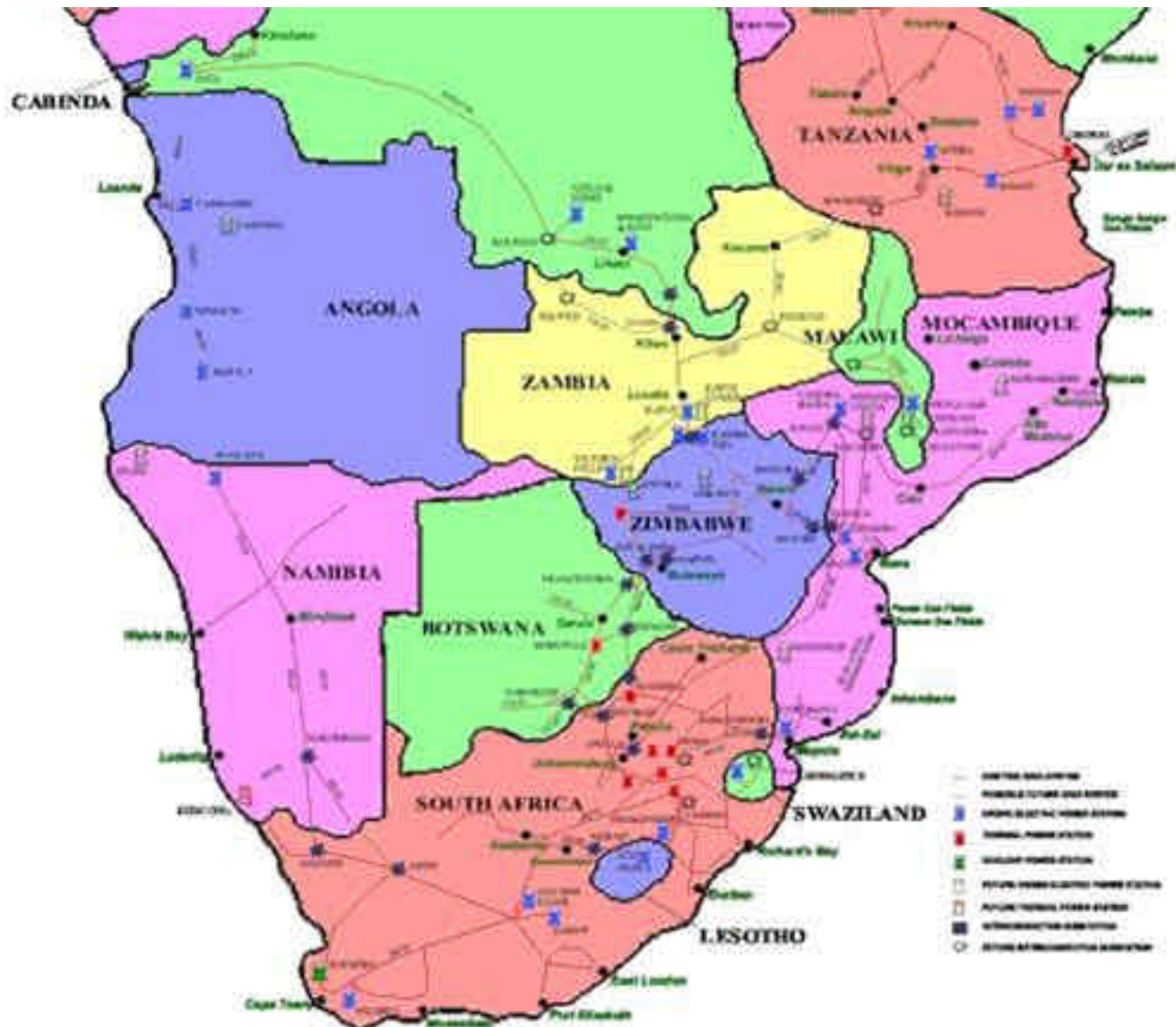
- Kafue Gorge Lower – 750 MW
 - Discussions ongoing between ZESCO and Sino Hydro of China
 - Envisaged implementation agreement signing in 2005
- Kariba North Extension – up to 360MW
 - Discussions ongoing between ZESCO and Sino Hydro of China
 - Feasibility study expected to be completed by September 2005

PROJECTS UNDER ACTIVE CONSIDERATION (2)

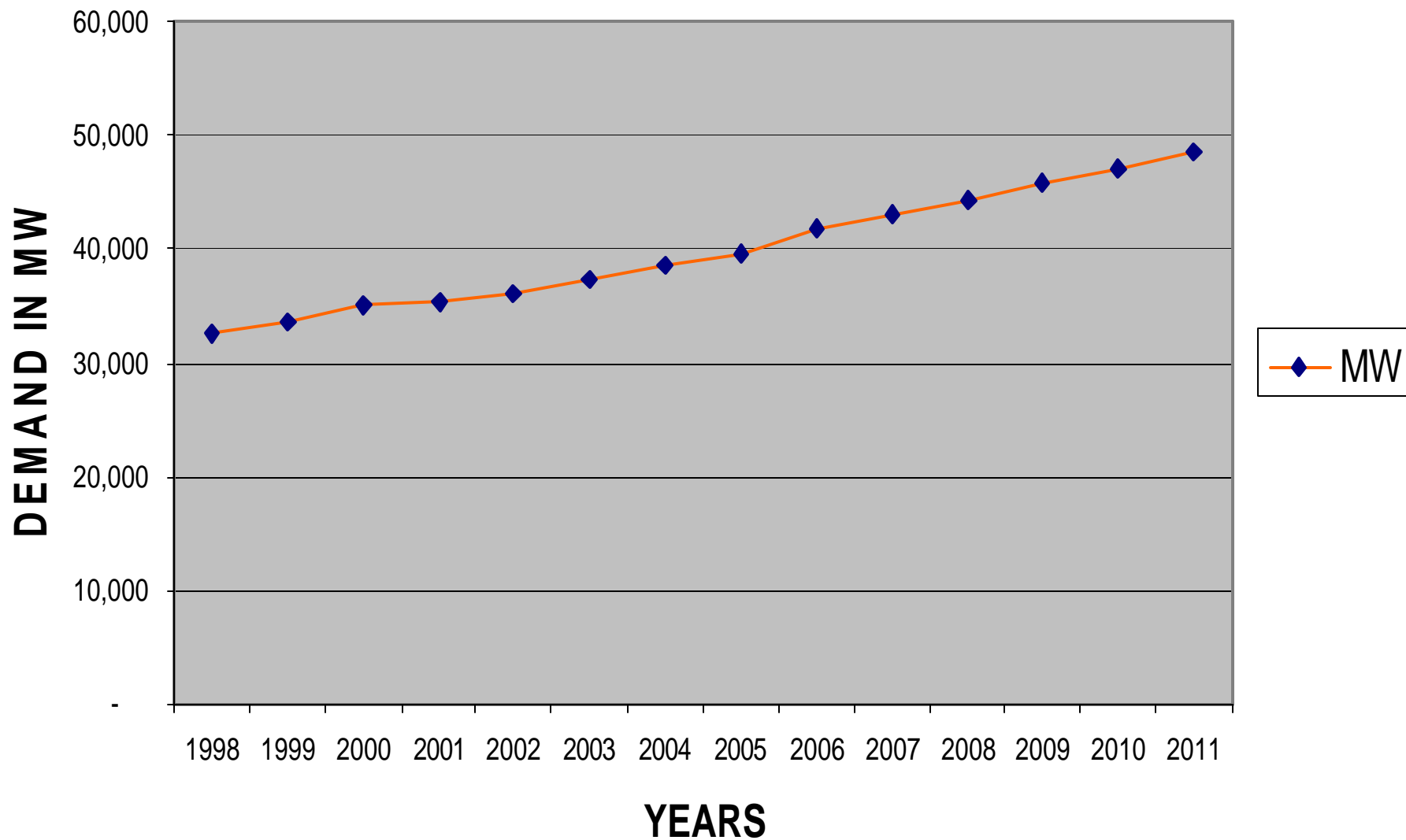
- Itezhi -Tezhi – 120 MW
 - Discussions ongoing between Farab Company and ZESCO
- Other small and mini hydros
 - Luakela development on Lwakera River
 - Nyimba
 - Zengamina

INTERCONNECTORS

SAPP



REGIONAL DEMAND FORECASTS



INTERCONNECTOR PROJECTS

- Zambia – Tanzania Interconnector
 - Two phases
 - 1st Phase 200MW
 - US\$352million
 - 330kV
 - 2nd Phase
 - US\$350million
 - Additional stringing and reinforcement
 - Solicitation underway
 - Implementation Agreements by early 2006
 - Commissioning 2008

INTERCONNECTOR PROJECTS (2)

- DRC – Zambia Reinforcement
 - Increases capacity to approx 500MW from 310MW
 - Bush clearing underway (Way leave preparation)
 - January 2007 commissioning

CHALLENGES

- Appropriate regulation of the off grid and private sector led initiatives of the REA
- Evolution of a sustainable regulatory environment that allows and encourages new players in large hydro development
- Management of the industry restructuring process
- Regulation of cross border electricity trade