CTIP Southern Africa
Co-generation Workshop

Dar es alaam

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Assessment of the Potential of State-of-the-art Biomass Based Technologies in Contributing to a Sustainable SADC Regional Mitigation Energy Scenario

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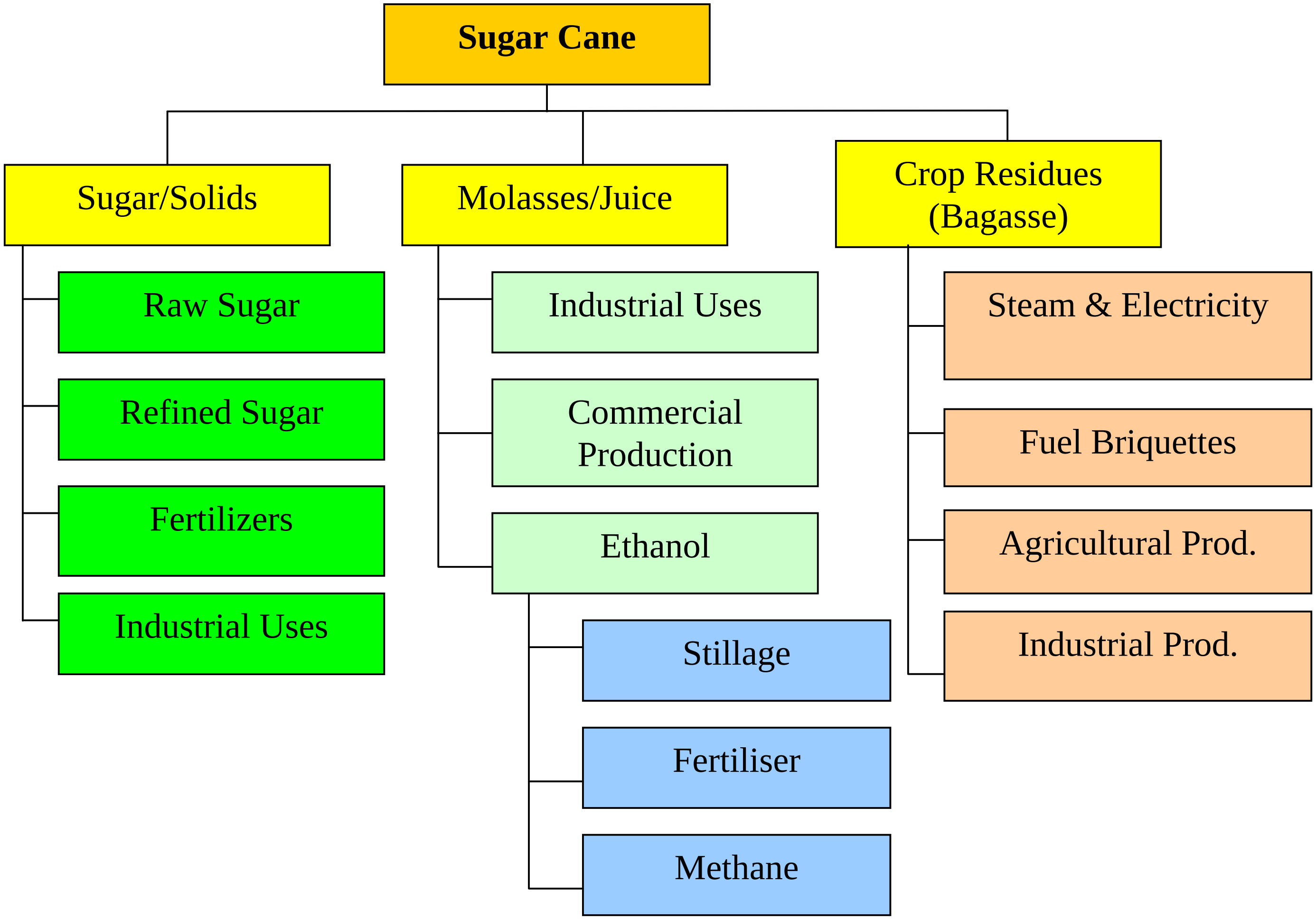
1.0 BACKGROUND ON BIOMASS POTENTIAL

- The sugarcane plant is one of the world's most cost effective and diversified renewable resources, offering many alternatives for production of food, energy, fibre and feed as shown in the following diagram...

THE CANE RESOURCE



EMERGING MARKETS (1)

The sugarcane industry often faces difficulties such as:

- **Competition in sugar industry due to:**
  - **Saturated market in industrialised countries**
  - **Competition from other sweeteners**

EMERGING MARKETS (2)

- Increased economic incentives in diversification into RE exist, but they are slowed by:
  - Institutional barriers
  - Continued supports for sugar production around the world

SOUTHERN AFRICAN CANE RESOURCE BASE

Country	Production 1000 tc	Area 1000 ha	Avg. Yield tc/ha	Bagasse Availability ('000 tonnes)
Angola	360	10	38	108
DR Congo	1669	36	46	500.7
Malawi	2000	19	105	600
Mauritius	5109	73	70	1532.7
Mozambique	397	27	15	119.1
South Africa	23896	322	74	7168.8
Swaziland	3885	37	106	1165.5
Tanzania	1355	15	90	406.5
Zambia	1600	15	107	480
Zimbabwe	4228	43	98	1268.4
SADC Total	***44498***	***596***	***75***	13349.4
World Total	***1,258,531***	***19,186***	***66***	
	3.5%	***3.1%***		

PROJECTED BAGASSE RESOURCE AVAILABILITY

Year	Bagasse Resource available (million tonnes)
2000	13.5
2010	16.5
2020	20.1
2030	24.5
2050	36.3

Assumption: 2% annual growth rate in sugar production

2.0 SOUTHERN AFRICA ENERGY SUPPLY BASELINE

SOUTHERN AFRICAN POWER POOL (SAPP)

- SAPP was created in 1995 through an inter-utility memorandum of Understanding among 12 of the SADC utilities including Congo DR resulting in a regional inter-connected system.

SAPP: STATUS QUO AND BASELINE FOR 2000

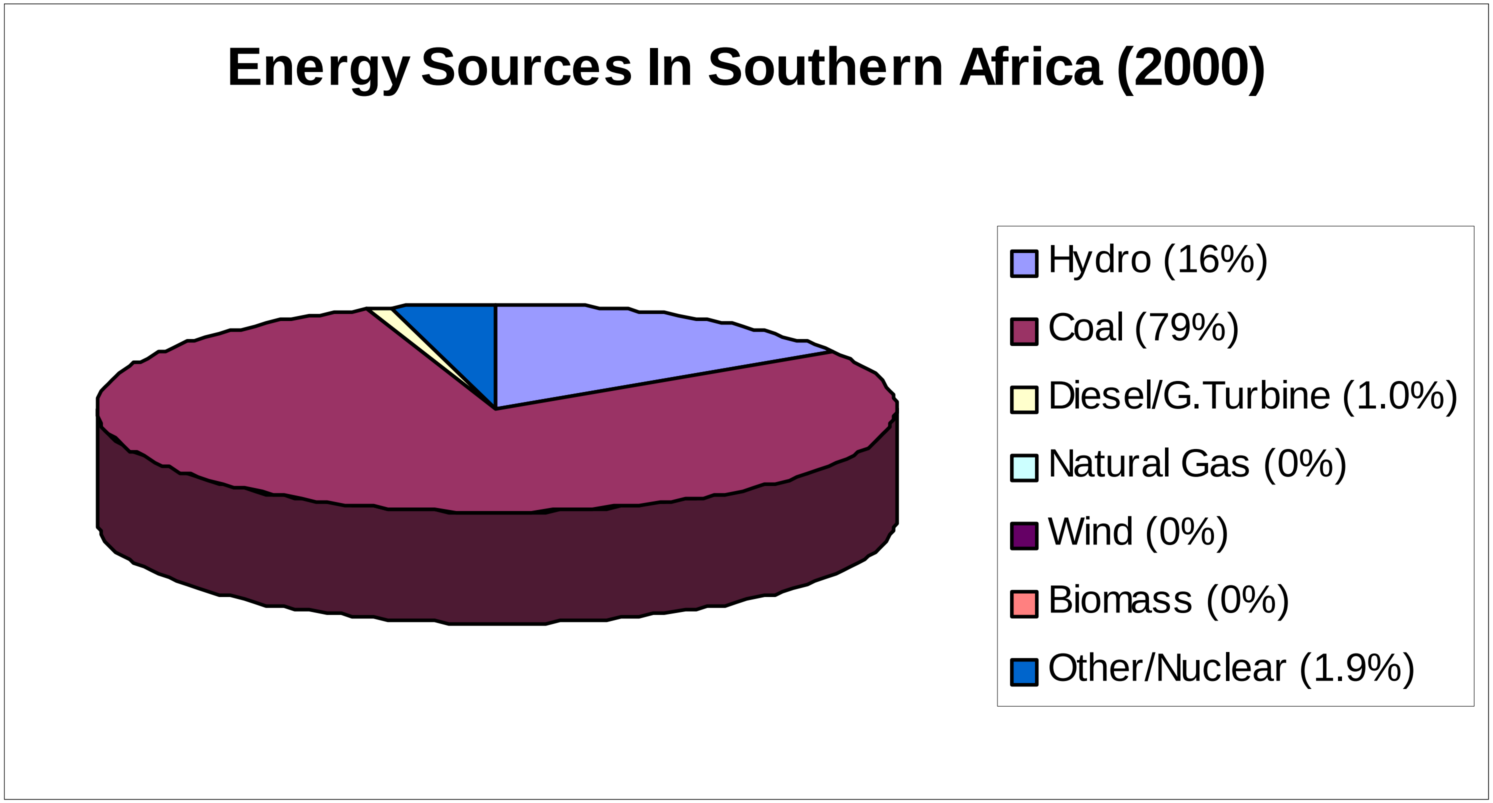


Figure: SAPP Installed Electricity Capacity for 2000 (Total Energy 45 GW)

SADC PROJECTED ENERGY DEMAND/SUPPLY SCENARIO

Assumption for growth rate:

	2015-2020	2020-2050
South Africa	2.0%	1.5%
Rest	3.5%	2.5%

SADC PROJECTED ENERGY SUPPLY (BASELINE)

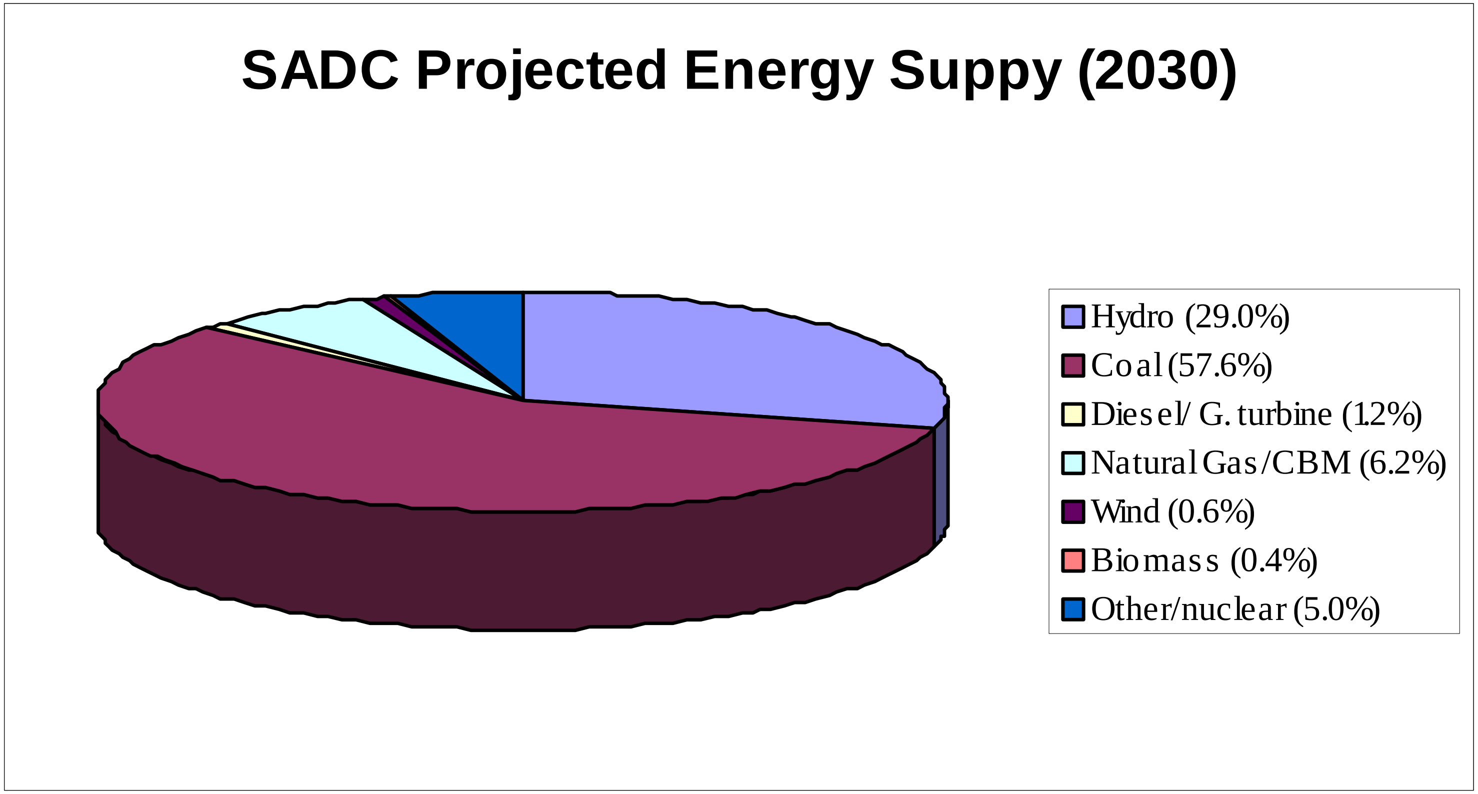


Figure: SADC Projected Energy Supply Scenario 2030 (Total Energy 80.2 GW)

SADC PROJECTED ENERGY SUPPLY (BASELINE)

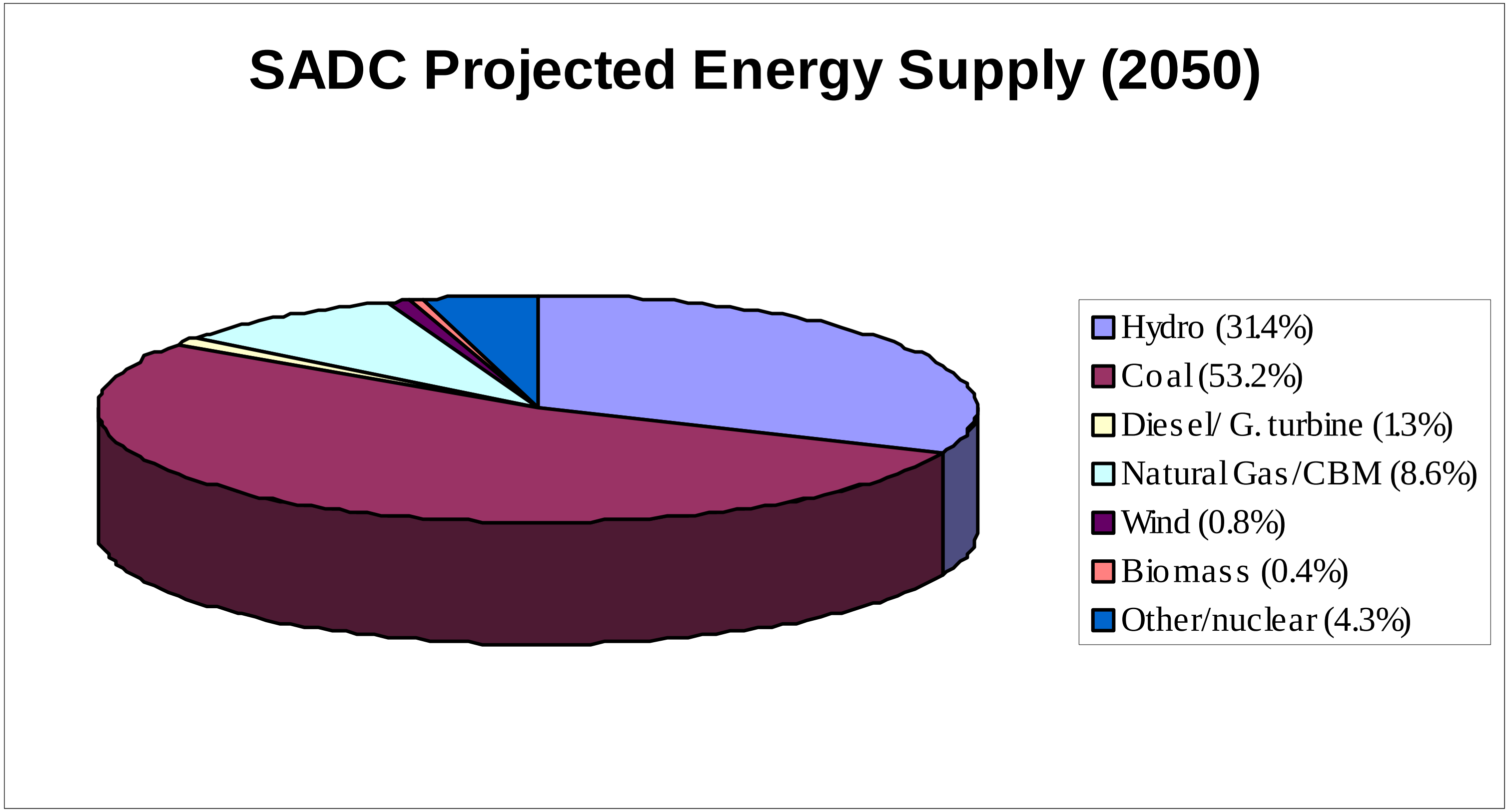


Figure : SADC Projected Energy Supply Scenario 2050 (Total Energy 115.2 GW)

3.0 SUSTAINABLE MITIGATION SCENARIO WHICH TAKES ACCOUNT OF THE ROLE OF BIO-ENERGY

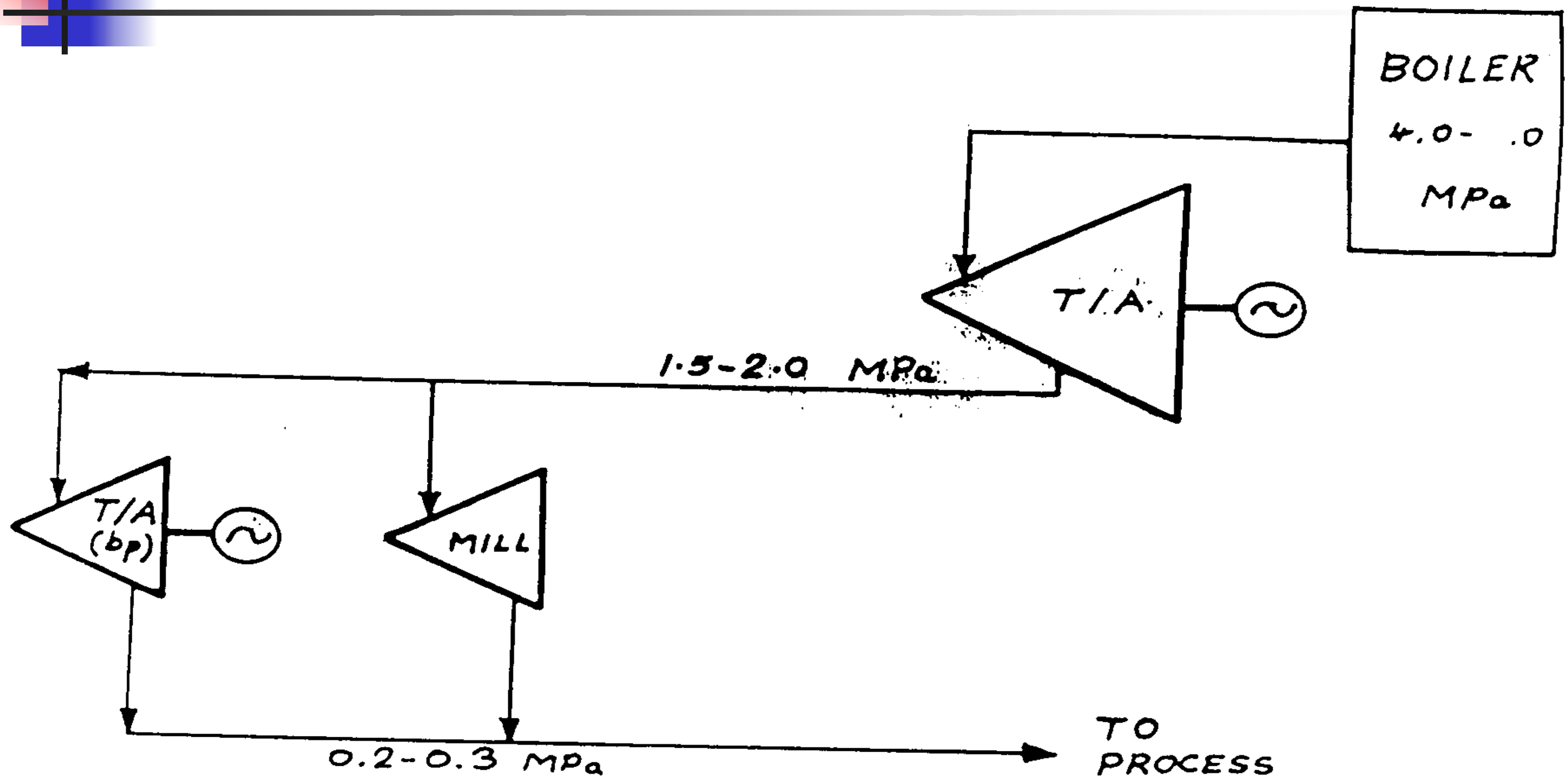
INTRODUCTION

- From SAPP's energy supply, it is evident that the role of bio-energy is negligible (0.4% of the total energy supply in 2050)
- Application of state-of-the-art biomass based technologies in Southern Africa can moderately alter this picture.

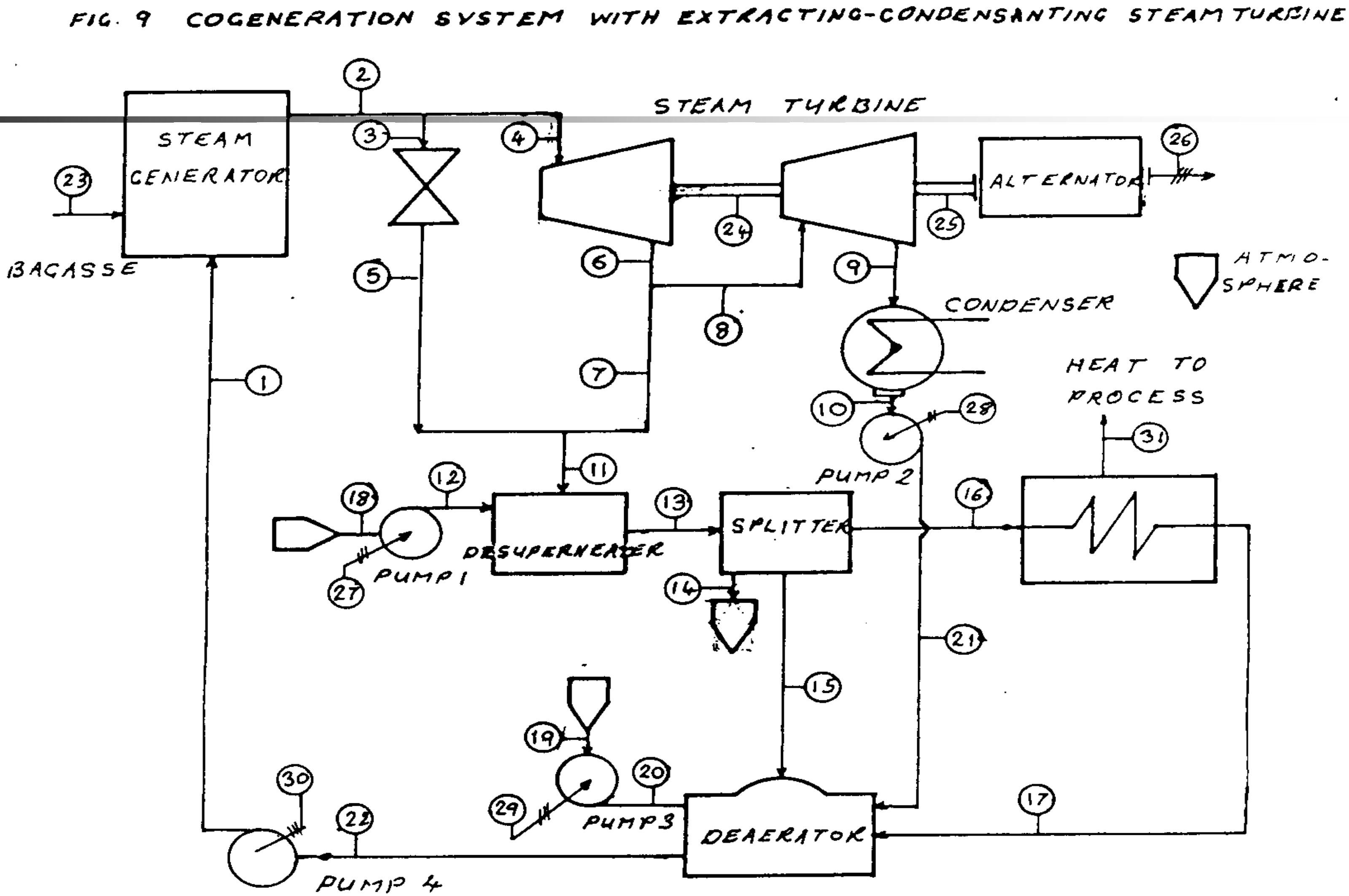
STATE-OF-THE-ART BIOMASS BASED TECHNOLOGIES (1)

- **Improved combustion in traditional boilers *(steam use optimisation and combustion control)***
- **CEST (Condensing Extraction Steam Turbine) *(High Pressure boilers)***
- **BIG/CC (Biomass Integrated Gasifier Combined Cycle) *(Combination of gas turbine and steam turbines)***

EXAMPLE OF CEST (1)

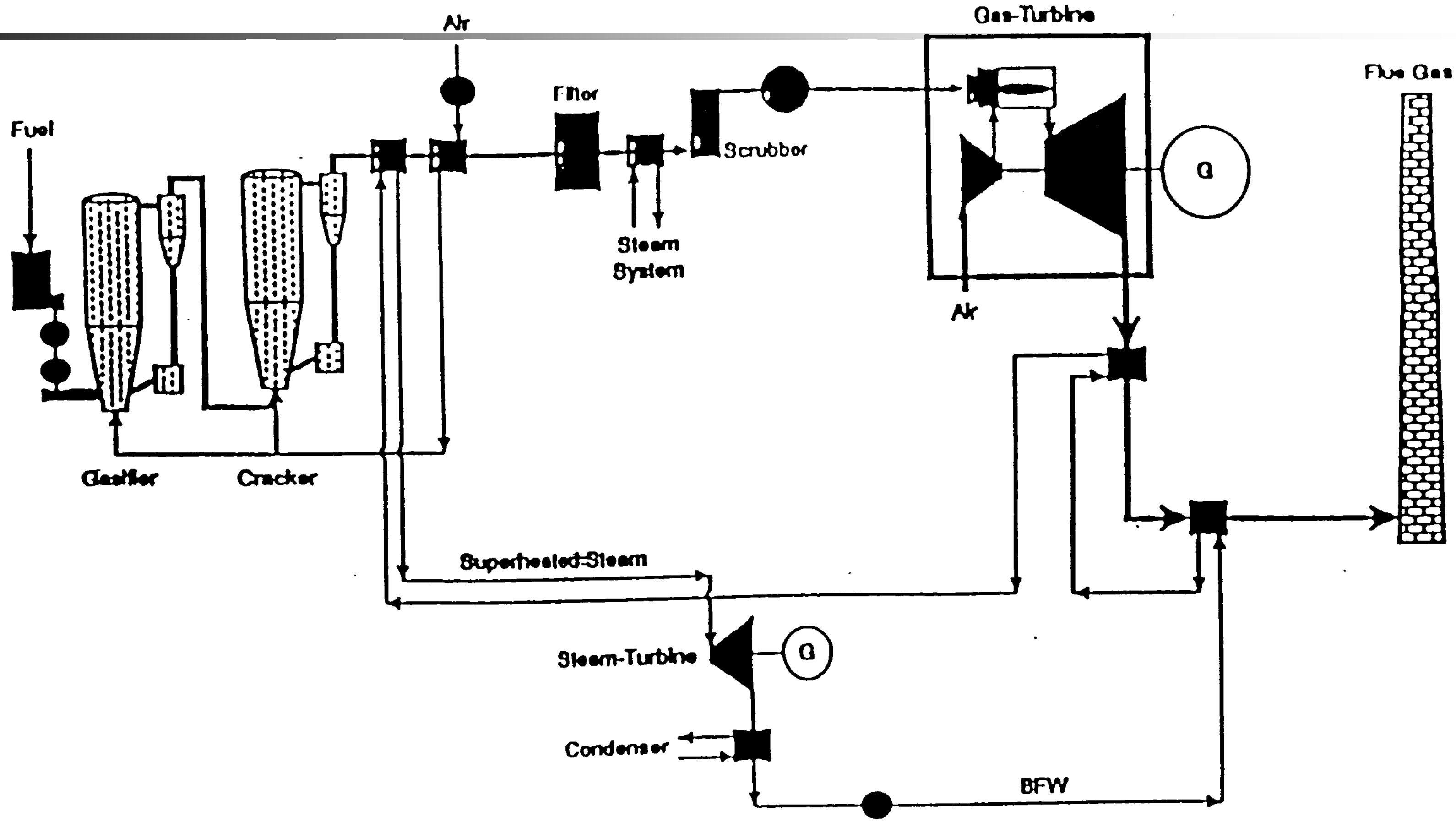


EXAMPLE OF CEST (2)



Cogeneration System with Extracting – Condensing Steam Turbine.

EXAMPLE OF BIG/CC



Combined Cycle with Integrated Atmospheric Gasifier

POTENTIAL SURPLUS ELECTRICITY GENERATED FROM SOUTHERN AFRICA'S FACTORIES BASED ON CURRENT & PROJECTED BASGASSE AVAILABILITY

Year	Bagasse Resource (million tonnes)	Traditional Boiler	Traditional Boiler with Improved Combustion (MW)	CEST (MW)	BIG/CC (MW)
2000	12.0	Nil	113	1350	2700
2010	15.0	Nil	135	1620	3240
2020	18.0	Nil	170	2010	4020
2030	22.0	Nil	207	2450	4900
2050	33.0	Nil	306	3630	7260

Assumption: Penetration level of 80%

CEST: PROVEN OF THE THREE (1)

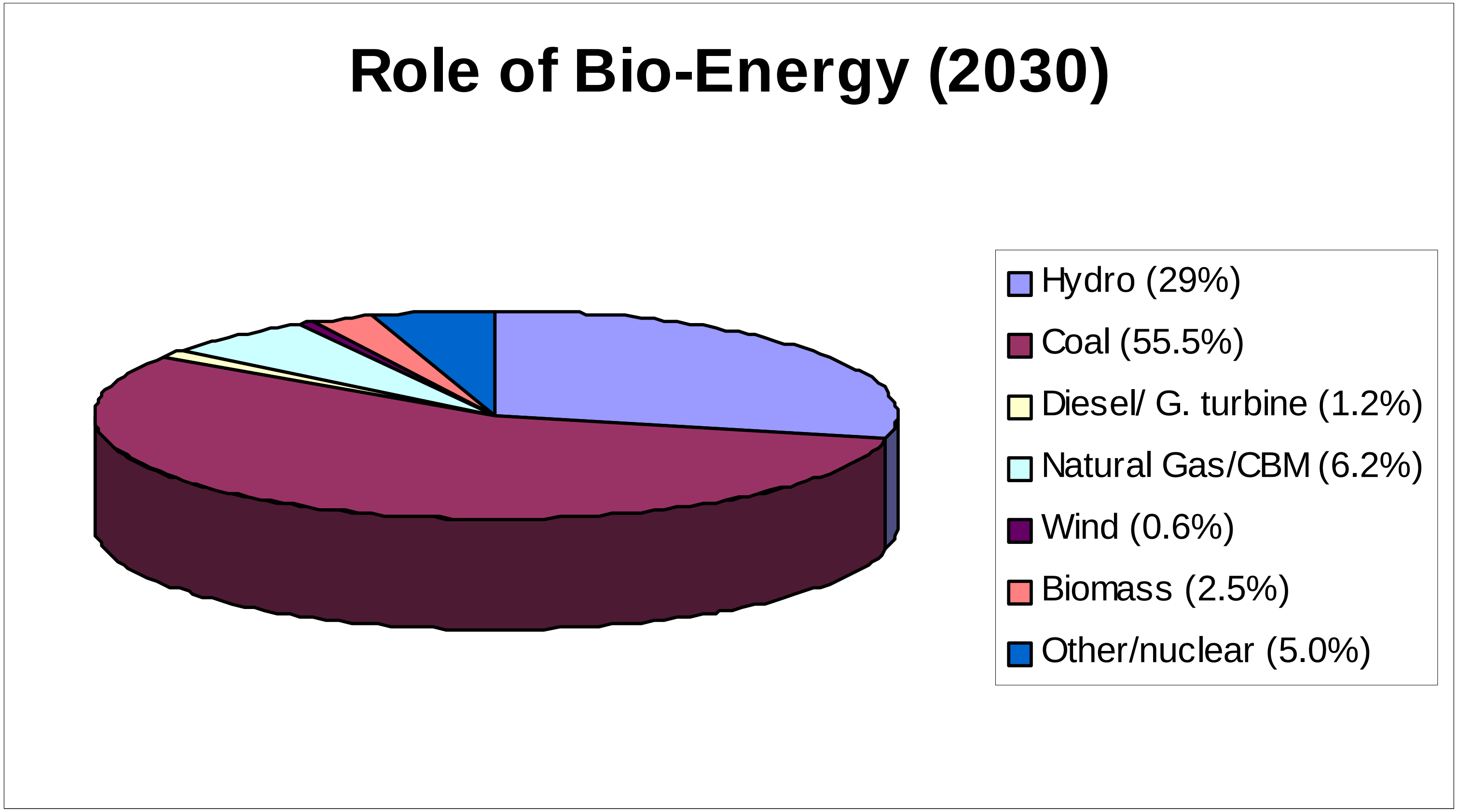


Figure: SADC Projected Energy Supply Scenario 2030 (Total Energy 80.2 GW)

CEST: PROVEN OF THE THREE (2)

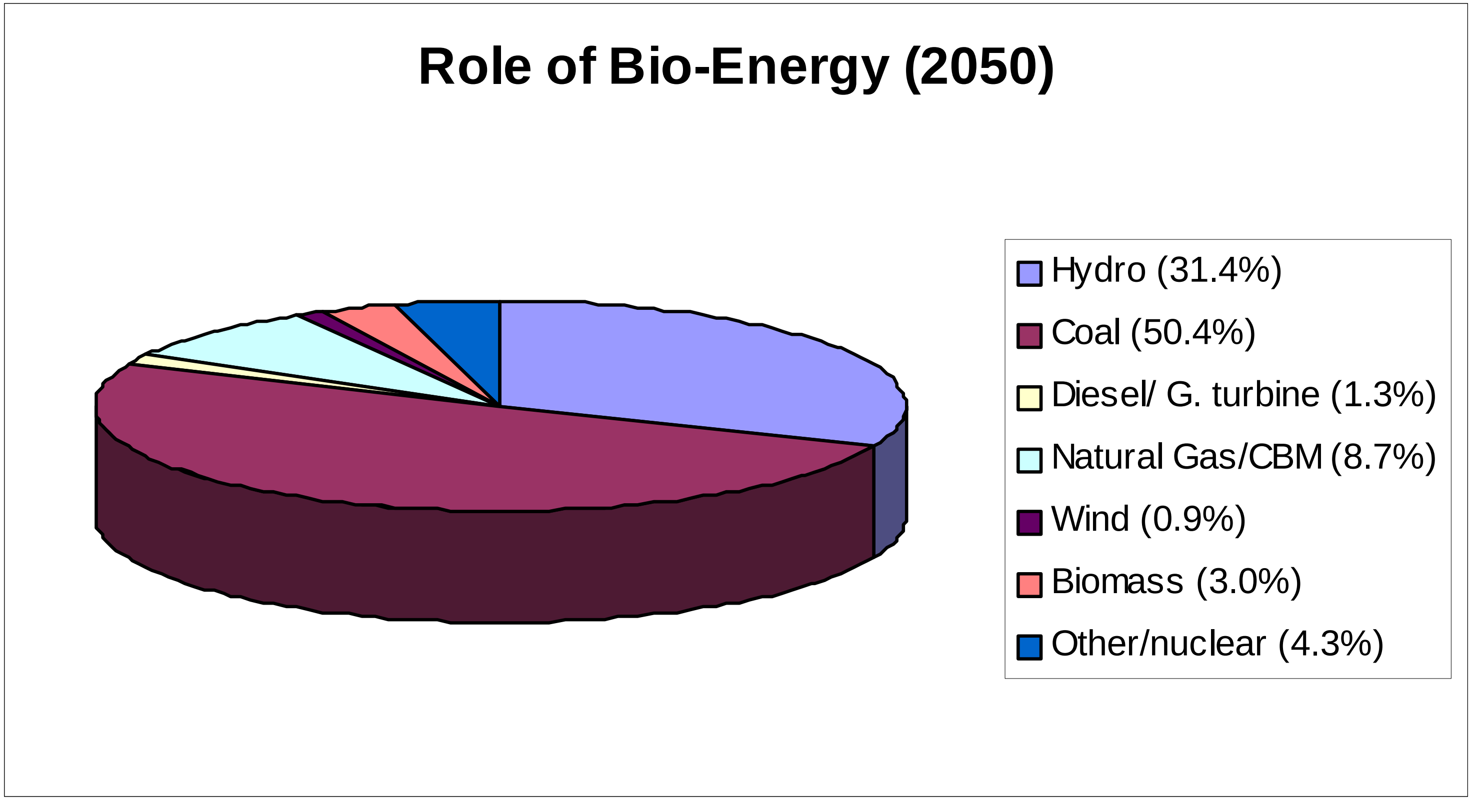


Figure : SADC Projected Energy Supply Scenario 2050 (Total Energy 115.2 GW)

4.0 SUSTAINABLE ENERGY PATH

- **Application of CEST technologies can potentially promote a sustainable energy path in the SADC Region**
- **In spite of this potential, there exist barriers as outlined below:**

BARRIERS TO INVESTMENT IN STATE OF THE ART BIOMASS BASED COGEN TECHNOLOGIES (FOR SOUTHERN AFRICA AND ZAMBIA)

- **Decision making process and behaviour *(uncertainty and risks due to high investment requirements and low returns)***
- **Lack of adequate financial support *(in particular commercial capital)***
- **Relatively low tariff**

BARRIER REMOVAL MEASURES TO INVESTMENT IN STATE OF THE ART BIOMASS BASED COGEN TECHNOLOGIES (FOR SOUTHERN AFRICA AND ZAMBIA)

- Awareness raising, and improved dissemination of information on cogeneration (to include creation of centralised databases)
- Development of enabling environment (policy/institutional)
- Awareness raising and mobilisation of FIs

SALE OF CARBON CREDITS AS A DRIVING FORCE FOR INVESTMENT

- It is widely accepted that sale of CARBON CREDITS contributes only 1 – 10% toward IRR, but the following will influence movement in the investment and implementation:
  - Emerging Green Venture Capital
  - Advance payments of carbon credits

ENVIRONMENTAL AND FINANCIAL BENEFITS FROM USE OF CEST (1)

- Environmental Benefits (GHG Saving)

Year	2010	2030	2050
GHG Saved (million Tonnes)	8.0	14.0	20.0

ENVIRONMENTAL AND FINANCIAL BENEFITS FROM USE OF CEST (2)

- Financial benefits of investing in such technologies will largely depend on electricity tariffs and cost of carbon credits, and scenario adopted from the following:
  - Business as usual without sale of carbon credits
  - Sale of carbon credits evenly spread over the life span of the project
  - 33% advance payments through sale of carbon credits.

ENVIRONMENTAL AND FINANCIAL BENEFITS FROM USE OF CEST (3)

❑ Financial Benefits (1)

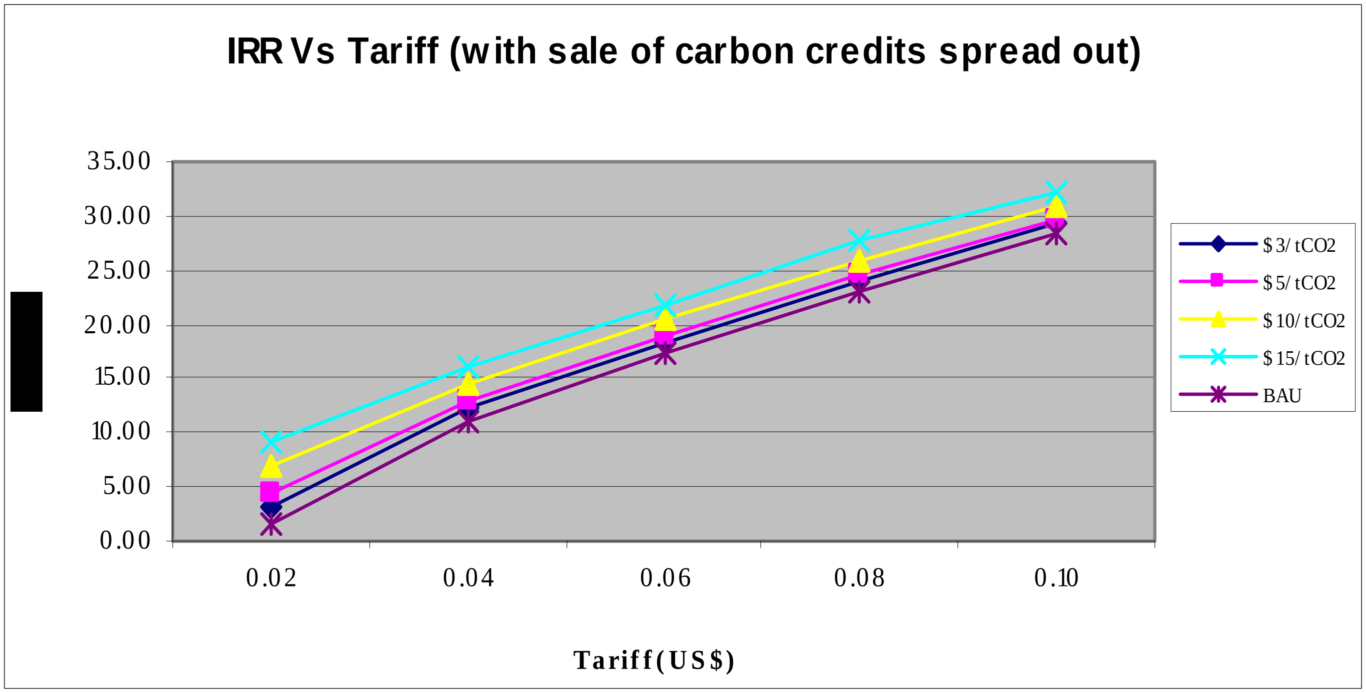


Figure : IRR Vs Tariff for different carbon prices (sale of carbon credits spread over project lifespan)

ENVIRONMENTAL AND FINANCIAL BENEFITS FROM USE OF CEST (4)

❑ Financial Benefits (2)

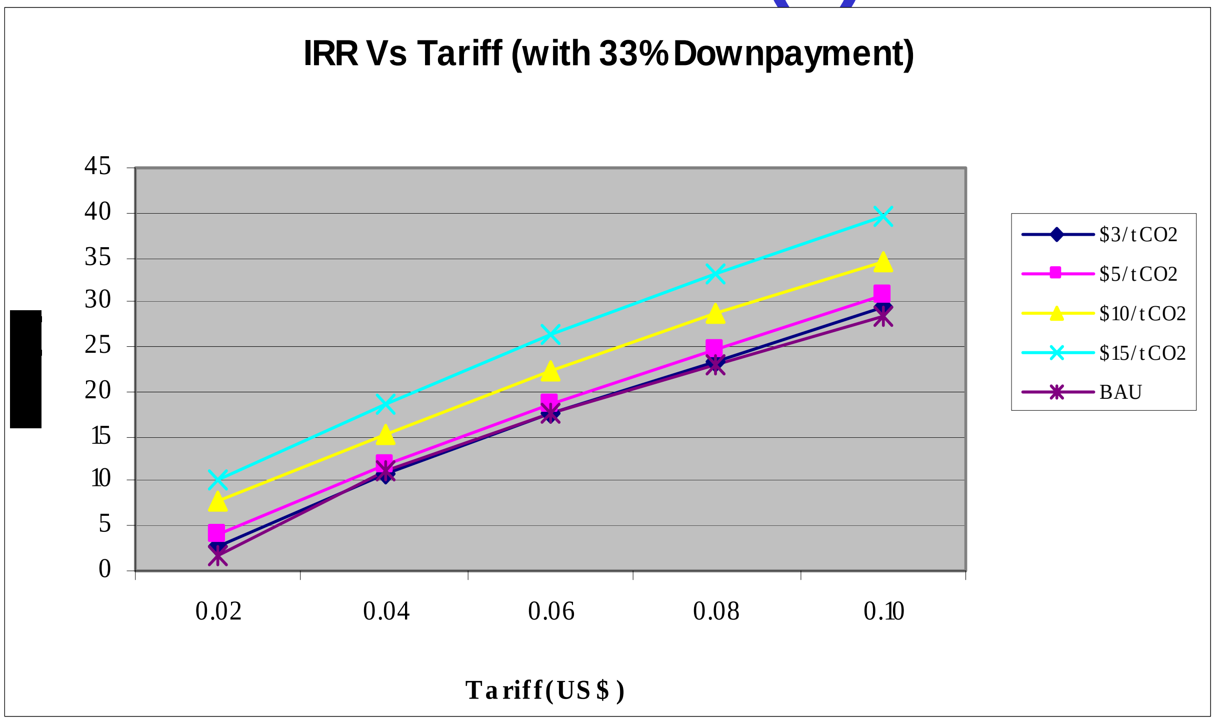


Figure : IRR Vs Tariff for different carbon prices (33% Down payment, rest spread over lifespan)

INVESTMENT REQUIREMENTS IN THE MITIGATION SCENARIO

Year	US$ (billion)	Contribution from sale of carbon credits through 33% advance payment (US$ billion)
2010	1.8	0.3
2030	3.3	0.5
2050	4.8	0.75

5.0 CONCLUSIONS (1)

- Application of CEST technologies in Southern Africa could modestly contribute towards sustainable energy supply mitigation scenario
- The scenario would also yield global benefits through GHG reductions
- Production of a monogram to assist investors in making decisions whether to invest with sale of carbon credits
- Successful implementation of the state-of-the-art biomass based technologies will largely depend on how policies evolve on involvement of IPPs, and tariff movements
- Advanced payment of carbon credits will improve the business cashflows in view of the barriers identified

5.0 CONCLUSIONS (2)

- Implementation of such projects requires policy on independent power production in each of the SADC countries
- In case of Zambia, this policy exists and therefore there exists no barrier for implementation from this perspective
- Existence of the policy on IPP comes as an opportunity for the existing sugar industry, as well as other agricultural activities, to either start, or improve cogeneration activities