

CAPACITY DEVELOPMENT FOR CDM PROJECT DEVELOPMENT IN BOTSWANA

Presentation at 2nd Workshop 7-9th September,
2011

Outline



- ACKNOWLEDGEMENT
- RATIONALE
- ABOUT GEF
- HOW IT IS DETERMINED
- RESULTS OBTAINED FOR INDIVIDUAL COUNTRIES AND FOR SAPP GRID
- WAY FOWARD

ACKNOWLEDGEMENT AND MAIN OBJECTIVE

- **Study commissioned by URC, UNEP and ACAD**
 - Funded by the German Ministry of Environment
 - Objective is to facilitate investments in renewable energy projects in the SAPP region
 - Facilitation by additional revenues through the Clean Development Mechanism (CDM)
 - SAPP CC
 - Project Team
 - GFA Envest, CEEEZ, ELI

RATIONALE FOR REQUIRING A GEF

- The Clean Development Mechanism (CDM)
 - ▣ incentives for grid connected renewable energy and energy efficiency projects
 - ▣ Projects based on the calculation of the grid emission factor (GEF) to determine volumes of carbon emissions a CDM project may offset from the grid hence Carbon credits
 - ▣ Of the 2403 registered CDM projects across all sectors in 2010, more than 1800 refer to some type of grid emission factor (IGES 2010).
- Several Southern African Power Pool (SAPP) countries dependent on hydropower generation
 - ▣ so introducing a CDM project would not offset any CO₂ emissions

RATIONALE contd

- Some such countries either export or imports substantial electricity to CO₂-intensive countries within SAPP grid but could not claim anything
- Even those with CO₂ intensive grid systems also do not have established GEF for project developers to use.
- RESULT- Transaction costs of producing GEF when PDD is submitted for validation; inconsistency in values that are used for same grid.
- EXERCISE : To determine national GEFs and also sub regional and extended grids that could cater for those countries with zero or low GEFs on their own even when they export/import to CO₂ intensive countries

About GLOBAL EMISSION FACTOR

- It's a Factor!
- Dependent on the fuels used to generate fuels
- Quality of fuels used (e.g. energy content) and whether must run/low cost type
- The no of power stations hooked to grid and their efficiencies
- Year they were introduced to the grid
- Electricity generated and sent out to grid with those fuels and those plants
- GEF then is expressed as tCO_2/GWh or tCO_2/MWh or kgCO_2/kWh .

How GEF is determined

- Dependent on UNFCCC- CDM Executive Board tool for doing so. “Tool to calculate the emission factor for an electricity system” (UNFCCC 2011),
- The Tool itself has been revised several times from 2002
- Bring in effect of existing power plants and those that are to be built-since CDM is likely to offset electricity being generated by existing power plants or offset power plant that would be built in the future
- Can be done at provincial, regional/national and international level

How GEF is determined contd

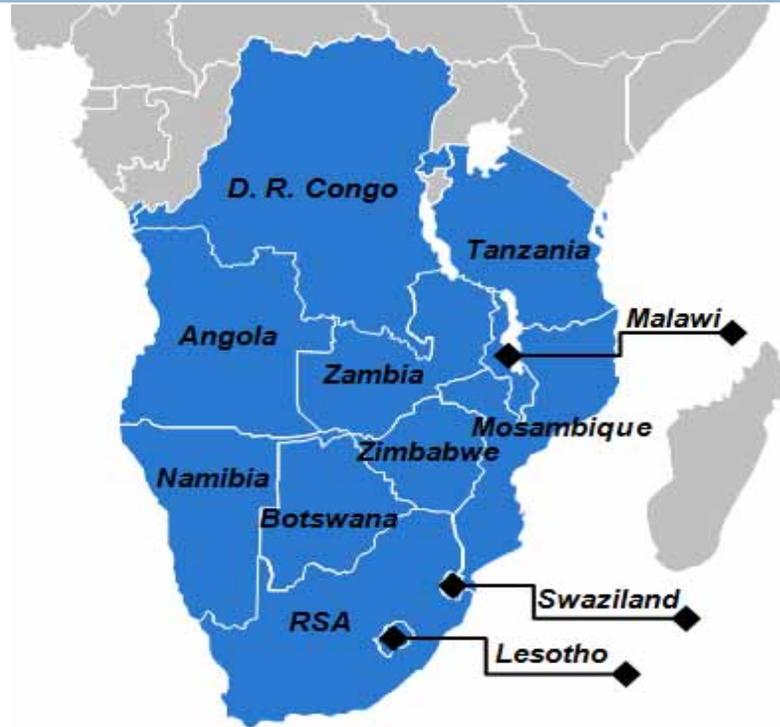
- Previous tool versions considered these within a well connected grid (Project Electricity Ssystem)- which is often a national grid
- Made provision that if going across borders (beyond PES to CES)- should have well connection. There is need to prove that before proceeding to calculate GEF
- Past versions of the Tool however considered imports to offset existing plants to have 0tCO₂/GWh regardless of source. Ambiguity on whether a recent significant transmission line could be considered as a source in determining emissions for plants to be built.
- Latest version of Tool allowed that imports from exporting grids in Non-Annex I could be included in determining GEF within PES

How GEF is determined contd

- Different ways you determine GEF for those that have sizeable CO₂ in grid and those with must run/low cost plants such as hydropower exceeding 50%
- Vintage of data-
 - 3 most recent years- to get a good average
 - 5 most recent years or long term to prove if you are predominately hydro
 - Can include 1 most recent year of off

DISPARITIES AMONG SAPP COUNTRIES

- SAPP countries that have predominant hydro- DRC, Swaziland, Mozambique, Zambia, Lesotho, Namibia and Zimbabwe
- Countries that are predominantly Fossil- RSA, Botswana
- Of 12 SADC countries, Countries NOT well connected to SAPP grid- Malawi, Tanzania and Angola
- Eight of the nine Operating Members of the SAPP are importers of electricity in the SAPP. The DRC is the only country which exports but does not import any electricity.



DATA REQUIRED FOR GEF
CALCULATION HELD BY 15 MEMBERS
OF SAPP

Table 3: SAPP Power Utility Members and Host Countries

No.	Country	Power Utility	Abbreviation
1	Angola	Empresa Nacional de Electricidade de Angola	ENE
2	Botswana	Botswana Power Cooperation	BPC
3	DRC	Société Nationale d'Electricité	SNEL
4	Lesotho	Lesotho Electricity Corporation	LEC
5	Malawi	Electricity Supply Commission of Malawi	ESCOM
6	Mozambique	Electricidade de Mozambique	EDM
7	Mozambique	Hidroelectrica de Cahora Bassa	HCB
8	Mozambique	Mozambique Transmission Company	Motraco
9	Namibia	NamPower	NamPower
10	RSA	Eskom	Eskom
11	Swaziland	Swaziland Electricity Board	SEB
12	Tanzania	Tanzania Electricity Supply Company	TANESCO
13	Zambia	Zambia Electricity Supply Corporation	ZESCO
14	Zambia	Copperbelt Energy Corporation	CEC
15	Zimbabwe	Zimbabwe Electricity Supply Authority	ZESA



Southern African Power Pool (SAPP)

- Managed by the SAPP Coordination Centre
- SAPP CC manages power trades and coordinates the development of the regional electricity sector
- Features 15 members in 12 countries
- Data with these members- About plants, fuels, electricity generated and sent out, year plants built
- The SAPP has an integrated generation and transmission expansion plan known as the Pool Plan. The Pool Plan compares the member countries' current demand with their electricity imports-**GUIDES**
Regional Integration

CALCULATION OF GEF

- TOOK ADVANTAGE of IGES spreadsheet that takes all base data on plants, year, Capacity, generation, fuel consumed in the number of years etc

Table 5: Summary of the National GEF for Botswana

OM Emission Factor (in t-CO ₂ /MWh)	1.1355		
BM Emission Factor (in t-CO ₂ /MWh)	1.0292		
	Weight of the OM	Weight of the BM	CM Emission Factor (in t-CO ₂ /MWh)
Wind and solar power generation project activities for the first crediting period and for subsequent crediting periods	0.75	0.25	1.1089
All other projects for the first crediting period	0.5	0.5	1.0824
All other projects for the second and third crediting period	0.25	0.75	1.0558

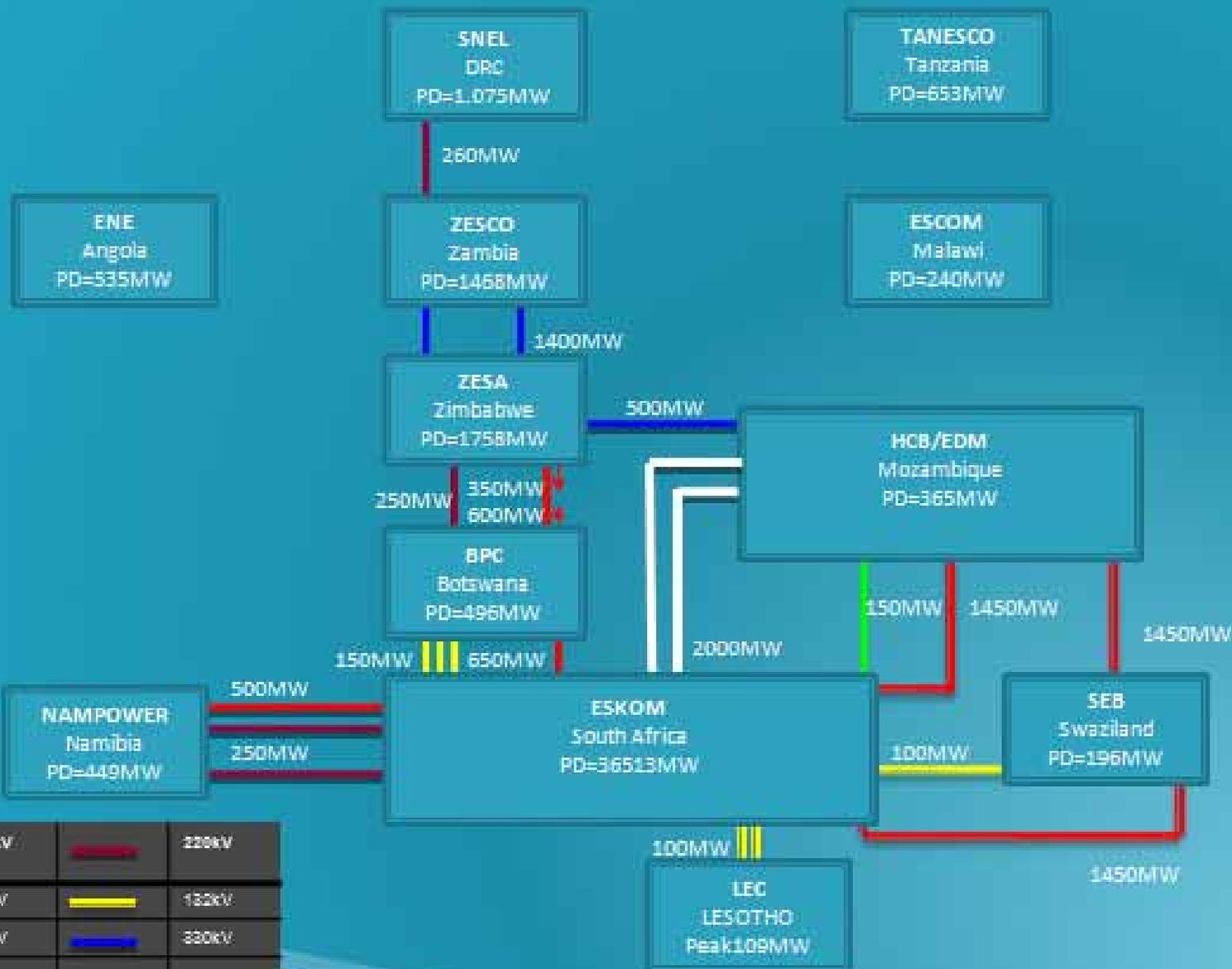
Table 1: Summary of the National- and SAPP GEFs

No.	Country	National Emission Factor (in tCO ₂ /MWh)	SAPP Emission Factor (in tCO ₂ /MWh)
1	Botswana	1.0824	1.0136
2	DRC	0.0000	
3	Lesotho	0.0038	
4	Mozambique	0.7198	
5	Namibia	0.9733	
6	RSA	1.0212	
7	Swaziland	0.7960	
8	Zambia	0.0087	
9	Zimbabwe	0.5579	

Data: All calculations are based on data covering the most recent three years, 2008-2010.

Consideration of Angola, Malawi and Tanzania

- Angola
 - ▣ Has a installed capacity of 676 MW hydro and 595 MW thermal
 - ▣ Will result in a significant GEF without regional SAPP GEF
- Tanzania
 - ▣ Has a GEF of 0.586 tCO₂/MWh calculated according to the Simple adjusted OM (Green Resources /Sao Hill project)
- Malawi
 - ▣ Has 261.6 MW hydro, no thermal stations
 - ▣ National GEF will be 0 tCO₂/MWh
 - ▣ Options:
 - 132kV transmission line to EdM North (100MW), once this becomes operational, the Malawi may benefit from the SAPP GEF
 - Evaluation of Off-grid emissions, inclusion in the GEF



	633 kV DC		220kV
	400kV		132kV
	275kV		330kV

Option 2: Development of a Regional GEF

Evaluation of Transmission Constraints

- UNFCCC specifies that a regional GEF may be applied if there are no transmission constraints
- Transmission constraints exist if the transmission lines operate above 90% of their

Evaluation of Transmissions Constraints by Transfer							
Exporting Utility	Importing Utility	Down (in MWh)	Up (in MWh)	Capacity (in MWh)	Down (in %)	Up (in %)	Evaluation
ZESCO	ZESA	424.613		6.132.000	7%	0%	Ok
SNEL	ZESCO	107.870		2.277.600	5%	0%	Ok
ZESA	BPC	1.568.531		2.628.000	60%	0%	Ok
BPC	ESKOM	1.452.837	2.353.865	4.599.000	32%	51%	Ok
HCB	ZESA	1.810.723	-	4.380.000	41%	0%	Ok
ESKOM	NamPower	1.683.997	2.722	5.475.000	31%	0%	Ok
ESKOM	SEC	575.842	172.174	11.388.000	5%	2%	Ok
ESKOM	LEC	164.327	-	876.000	19%	0%	Ok
ESKOM	EdM-South	1.882.564	-	10.512.000	18%	0%	Ok
HCB	ESKOM	10.643.400	-	17.520.000	61%	0%	Ok
EDM-South	SEC	172.174	-	10.512.000	2%	0%	Ok

Development of a Regional GEF

- Tacking Stock of the Electricity Sector
 - SAPP electricity sector (9 countries) features 62 power stations
 - 34 hydro power stations (19,607 MW), 19 coal power stations (39,607 MW), 7 diesel (1,783 MW), one NG (746 MW) and one nuclear (1,939 MW)
 - No transmission constraints -> Integration into one regional 'Project Electricity System'
- Calculation of the SAPP GEF
 - 'Must-runs' (hydro, nuclear) generate 19.87% of total electricity
 - Simple Operational Margin calculation is applicable
 - Focus on the 'Non-must-runs' (thermal power stations) leading to a high GEF
- Outcome
 - SAPP GEF amounts to 1.0136 tCO₂/MWh

Financial Implications

□ Carbon Finance Impact

- Price for one CER currently amounts to 18 USD
- Assuming a price of 15 USD/CER and the SAPP GEF of 1.0136 tCO₂/MWh:
 - Carbon finance impact amounts to 1.52 USDc per kWh
 - Huge Impact!

□ Outlook

- SAPP Pool Plan features 86 projects with a total installed capacity of 31,901 MW
- Hydro: 13,389 MW resulting in a 58,685,080 MWh/yr (estimate)
- Applying the SAPP GEF: 59 million CERs/yr resulting in a

WHITHER TO FROM HERE

- RSA and Botswana have higher national GEF calculations
- All other countries are better off with the regional SAPP GEF
- Assumption: GEF is optional, has to be verified with CDM EB

➤ **Issuance of LoA**

- In 2006, the CDM Executive Board decided that a regional GEF is feasible
- But it requires Letter of Approvals from all countries involved
- SAPP GEF: A CDM project participant shall receive 9 LoAs!

WHITHER TO FROM HERE

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- CDM EB confirmed that LoA issue is a binding requirement. So if someone wants to develop a Project, this would require the LoA of all nine countries and there is no way to change this
- UNFCCC CDM Secretariat proposed to develop a standardized baseline (SBL). If the GEF is submitted as SBL, anyone just could use it, without nine LoAs
- UNEP decided to pursue this option. SBL procedures shd be operational now. The SBL would require the nine DNAs to submit jointly this one GEF which then would be checked and approved by the Secretariat itself

WHITHER TO FROM HERE

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- In building the DNA's confidence, we have proposed UNEP to validate our SAPP GEF through a DOE (as part of our report's recommendation).
- o Additionally we discussed the idea to develop a CDM PoA for Hydro, which then applies the GEF/SBL. If this PoA is registered before 2012, it would allow selling all CERs also from CPAs which are registered after 2012 to the EU-ETS
- In order to develop a PoA, we need to have a demonstration project as first CPA.

PERSPECTIVES

- Data setback when doing such work.
- The regional GEF is currently valid –as refinements will not make much difference to the values unless when large plants are installed.
- SAPP CC offers a very appropriate institutional setup to update the regional and national GEFs
- SAPP CC declared its readiness to implement the annual updating of the GEFs and to publish the SAPP GEF at its website. This may ensure that the GEF is publically available
- Power utilities report data according to the financial (i.e. April to March) year, others according to the calendar year, Would Approach utilities with data reporting templates-May/June for data to cater for disparity in reporting

PERSPECTIVES

- recommended that SAPP CC's GEF updating activities are accompanied by a CDM Consultant-for preparation of power utility specific reporting templates as well as for the integration of the findings in the GEFs
- two day CDM workshop with all relevant regional stakeholders. The stakeholders comprise host country DNAs, the Ministries of Energy as well as the national power utilities
- Conducting a side event at COP 17 by UNEP in connection with SAPP CC



Thank You