

Tool for Retail Tariff calculation (Retail Tariff Tool)

This explanation relates to the Retail Tariff Tool provided at the **Mini-Grid Policy Toolkit Portal**. This Tool and further support tools are available for download at minigridpolicytoolkit.euei-pdf.org/tools

The Retail Tariff Tool is a rather complex tool that allows accommodating various inputs in order to calculate appropriate retail tariffs. The notes included in the tool should be used for better understanding of individual inputs.

Inputs include the costs occurring in initial year, costs of each year of sales and the duration of tariff regime. Forecasted consumption for individuals and specific groups predicts future energy supply's levels. Operating costs, CAPEX and inputs related to financing costs are the main inputs and, together with the additional information, such as approximate depreciation period of assets, are used for calculation the retail tariffs that would cover the costs of distribution and transition. The tool considers additional income that is earned during using the assets, such as dis- and connection and reading fees or rental income.

Based on the costs, the tool **calculates the required revenue and the corresponding tariffs for a period of 25 years** (until 2040). While the tariffs are being kept constant (in real terms) for 5 years, after this period the tariff is being updated (five-year basis updates); based on the Net Present Value (NPV) of the required revenue and the billed consumption. The Tool also factors inflation rate in the calculation and adjusts both, nominal and real tariff cost recovery tariff, displayed also visually.

Based on all the inputs (tariff revenues collected, costs, interest rate, etc.), **the Tool provides the cash-flow analysis**, consisting of the investing, operating, financing and net cash flows for the period until 2040.

The Tool was prepared as part of the EUEI PDF project for the Regional Electricity Regulators' Association of Southern Africa (RERA) to establish a framework for attracting increased investment in mini-grids employing renewable and hybrid generation in Southern African Development Community (SADC).

Glossary

Net Present Value – NPV of a time series of cash flows, both incoming and outgoing, is defined as the sum of the present values of the individual cash flows

Return on Equity (RoE) - measures a corporation's profitability and represents the amount of net income returned as a percentage of shareholders' equity

Inputs

	Unit	Notes	2014	2015	2016	2017
General						
First year of costs	year	<i>The first year that costs are</i>	2014			
First year of operation	year	<i>The year sales begin</i>	2015			
Tariff period	years	<i>The period over which tariff</i>	5			
Billed consumption						
Domestic customers	kWh			40.000.000	40.800.000	41.616.000
Commercial/industrial customers	kWh			10.000.000	10.200.000	10.404.000
	kWh	<i>Input forecast billed</i>				
	kWh	<i>electricity consumption by</i>				
	kWh	<i>customer category</i>				
	kWh					
	kWh					
Total	kWh		-	50.000.000	51.000.000	52.020.000
Operating costs						
Fuel costs	\$			4.050.000	4.050.000	4.050.000
Generator maintenance costs	\$	<i>Input operating costs by</i>		500.000	500.000	500.000
Network maintenance costs	\$	<i>category. This should</i>		500.000	500.000	500.000
Administration costs	\$	<i>include power purchase</i>		250.000	250.000	250.000
Staff costs	\$	<i>costs. All cost forecasts</i>		500.000	500.000	500.000
	\$	<i>should exclude inflation.</i>				
	\$					
Total	\$		-	5.800.000	5.800.000	5.800.000
Capital costs (less capital contributions)						
Development	\$	<i>Input capital costs by asset</i>	1.000.000			
Generator	\$	<i>type. This should be the all-</i>	20.000.000			
Network	\$	<i>in cost (including interest</i>	4.000.000			
Land	\$	<i>during construction).</i>	1.000.000			
Meters	\$	<i>Capital contributions</i>	200.000			
	\$	<i>should be excluded from</i>				
	\$	<i>capital costs.</i>				
Total	\$		26.200.000	-	-	-
Average asset lives by asset type						
Development	years		20			
Generator	years	<i>Input average asset lives</i>	20			
Network	years	<i>for each asset type entered</i>	20			
Land	years	<i>above. Leave blank or</i>	20			
Meters	years	<i>enter NA if asset does not</i>	20			
	years	<i>depreciate.</i>				
	years					
Collection rate						
Collection rate as a percentage of	%	<i>The percentage of billed revenue that is co</i>		90,00%	90,00%	90,00%
Deductible income						
Connection and disconnection fees	\$	<i>Input non-tariff income</i>		50.000	50.000	50.000
Rental income	\$	<i>that is earned using assets</i>		50.000	50.000	50.000
	\$	<i>paid for from above costs.</i>				
	\$	<i>This may include</i>				
	\$	<i>connection and</i>				
	\$	<i>disconnection fees,</i>				
	\$	<i>metering reading fees,</i>				
Total	\$		-	100.000	100.000	100.000
Financing costs						
Gearing	%	<i>The percentage of investme</i>	70,00%			
Loan period	years	<i>The repayment period of loc</i>	10			
Interest rate (nominal)						
Nominal	%	<i>Interest rate (on loans) inclu</i>	16,00%			
Real	%	<i>Interest rate (on loans) excl</i>	12,00%			
Pre-tax return on equity						
Nominal	%	<i>The return that the investor</i>	22,00%			
Real	%	<i>The return that the investor</i>	18,00%			
Weighted average cost of capital	%	<i>The weighted average cost</i>	13,80%			

Calculations

	Unit	Comments	2014	2015	2016	2017
Depreciation						
Development	\$	<i>Annual depreciation, calculated based on accelerated rate (using average asset lives). Assumes capital expenditure occurs midway through the year</i>	-	50.000	47.500	45.125
Generator	\$		-	1.000.000	950.000	902.500
Network	\$		-	200.000	190.000	180.500
Land	\$		-	50.000	47.500	45.125
Meters	\$		-	10.000	9.500	9.025
	\$		-	-	-	-
	\$		-	-	-	-
Total	\$		-	1.310.000	1.244.500	1.182.275
Closing asset base						
Development	\$	<i>The depreciated value of assets as at the end of the year</i>	1.000.000	950.000	902.500	857.375
Generator	\$		20.000.000	19.000.000	18.050.000	17.147.500
Network	\$		4.000.000	3.800.000	3.610.000	3.429.500
Land	\$		1.000.000	950.000	902.500	857.375
Meters	\$		200.000	190.000	180.500	171.475
	\$		-	-	-	-
	\$		-	-	-	-
Total	\$		26.200.000	24.890.000	23.645.500	22.463.225
Return on capital						
Return on capital (pre-tax)	\$	<i>Return on capital, before tax</i>	-	3.525.210	3.348.950	3.181.502

Tariffs

	Unit	Comments	2015	2016	2017
Revenue requirement					
Operating costs	\$	<i>The three main 'building blocks' of the costs of supplying electricity.</i>	5.800.000	5.800.000	5.800.000
Depreciation	\$		1.310.000	1.244.500	1.182.275
Return on capital	\$		3.525.210	3.348.950	3.181.502
Total costs	\$		10.635.210	10.393.450	10.163.777
Collection rate	%	<i>Costs are grossed up to reflect the fact that some</i>	90,00%	90,00%	90,00%
Total costs plus uncollected	\$		11.816.900	11.548.277	11.293.086
Less: Deductible income	\$	<i>Non-tariff income is deducted to give the total</i>	- 100.000	- 100.000	- 100.000
Total revenue requirement	\$		11.716.900	11.448.277	11.193.086
Average tariffs					
Revenue requirement	\$	<i>Revenue is divided by billed consumption to</i>	11.716.900	11.448.277	11.193.086
Billed consumption	kWh		50.000.000	51.000.000	52.020.000
Tariff update?	yes/no		Y	N	N
NPV (revenue requirement)	\$	<i>Tariffs are kept constant (in real terms) between updates.</i>	38.877.305		
NPV (billed consumption)	kWh		178.609.492		
Average tariff	\$/kWh		0,22		
Cost-recovery tariffs					
Cost recovery tariff (real)	\$/kWh	<i>Shows annual tariffs, adjusted at the end of each tariff period, in both</i>	0,22	0,22	0,22
Inflation factor	factor		1,04	1,08	1,12
Cost recovery tariff (nominal)	\$/kWh		0,23	0,24	0,24
Adjustments to tariffs to improve cashflow					
Tariff adjustment factor	factor	<i>Adjustment factors can be used to change the profile of tariffs so that cash flow</i>	1,00	1,00	1,00
Adjusted tariff (real)	\$/kWh		0,22	0,22	0,22
Adjusted tariff (nominal)	\$/kWh		0,23	0,24	0,24
Cash at End of Year	\$	<i>Cash flow indicators are calculated on the cash</i>	- 509.607	- 343.537	526.382
Debt service coverage	factor		0,72	1,09	1,47

Cash flow Analysis

	Unit	Comments	2014	2015	2016	2017
Operating cash flows						
Tariff revenue collected	\$	Total tariff revenue, less the	-	10.186.793	10.806.150	11.463.164
Deductible revenue	\$	Plus non-tariff revenue	-	104.000	108.160	112.486
Operating costs	\$	Less operating costs.	-	6.032.000	6.273.280	6.524.211
Interest on loans	\$	Plus interest on loans, which is calculated a	-	2.934.400	2.640.960	2.347.520
Net operating cash flow	\$	Gives the annual operating	-	1.324.393	2.000.070	2.703.919
Investing cash flows						
Investment costs	\$		- 26.200.000	-	-	-
Net investing cash flow	\$	The cost of capital expendi	- 26.200.000	-	-	-
Financing cash flows						
Proceeds on loan	\$	As above, assumes that cap	18.340.000	-	-	-
Principal paid on Loan	\$	Loan paid based on term of loan	-	1.834.000	1.834.000	1.834.000
Equity contributions	\$	Equity share of capital expi	7.860.000	-	-	-
Net financing cash flow	\$	Gives the anna	26.200.000	- 1.834.000	- 1.834.000	- 1.834.000
Net cash flows						
Cash at Beginning of Year	\$		-	-	509.607	343.537
Net Change in Cash	\$		-	509.607	166.070	869.919
Cash at End of Year	\$		-	509.607	343.537	526.382
Debt service coverage						
Debt service coverage ratio	ratio			0,72	1,09	1,47

Visualisation of the Cash flow analysis

