Energy Regulators Regional Association

Georgian National Energy and Water Supply Regulatory Commission (GNERC)

An assessment of WACC levels for Georgian regulated utility companies

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1 Introduction

The Georgian National Energy and Water Supply Regulatory Commission (GNERC) will soon initiate the Periodic Review to set the Regulatory Cost Base (RCB) of the regulated utilities for three years starting from 1 January 2018.

One of the main inputs to the Regulatory Cost Base is the Weighted Average Cost of Capital (WACC) which represents the expected return required by debt and equity holders of regulated utilities for financing utility infrastructure. GNERC staff are familiar with WACC-setting principles however would like to cooperate with the Energy Regulator's Regional Association (ERRA) in order to identify international best practice in setting WACC and to design a WACC model which is tailored to fit Georgia's circumstances.

GNERC currently applies a pre-tax WACC level of 13.54% for all regulated utilities. The WACC level has been criticized by regulated utilities as being insufficient to cover their cost of financing as, according to them, it does not compensate for the higher risk levels perceived by financiers, most significantly related to exchange rate risks. On the other hand, GNERC faces the technical challenge of estimating WACC inputs in an environment with low stock exchange capitalization and lack of reliable long-term data typically required to reasonably estimate WACC.

This document presents the consultant's views on the likely WACC calculation methodologies which may be applied in the forthcoming Regulatory Period. It should be noted that WACC calculation is a complex process both theoretically and practically, even in countries where historical data on debt rates, market shares and returns are abundantly available. Outcomes largely depend on the choice of the appropriate models, the period analyzed and the econometric tools utilized to forecast future financing costs. For practical purposes, two different approaches – similar to those applied by GNERC in the current Regulatory Period – are presented in this document. Due to the varying results which can result depending on the assumptions taken, a range of possible WACC values, rather than a single value, are be provided.

2 The existing framework

GNERC currently sets the Regulatory Cost Base by applying a pre-tax nominal WACC of 13.54% to the Regulatory Asset base set during Regulatory Periods. GNERC sets a WACC value for the whole length of the regulatory period of three years, which reduces perceived risk as, from the perspective of debt and equity holders, it represents a more stable and predictable regulatory framework.

According to GNERC's secondary legislation[1], WACC is to be set using a debt to asset ratio of 60% and the return on equity is to be calculated using the Capital Asset Pricing Model. The rest of the inputs were set as per the values summarized in Table 1.

[1] Resolution No. 14 "On Approving Electricity Tariff Calculation Methodologies" available at http://gnerc.org/files/Acts%20in%20english/Tariff%20Setting%20%20Methodology%20for%20Electricity_opt.pdf

Table 1 *GNERC's 2014 WACC calculation*

Methodology	WACC Input	Level	Rationale
(a)	Risk-free rate (r_f)	7.5%	Yield to maturity rate on a Georgian Government 10-year Euro bond issued in 2011.
(b)	Debt Premium (d_p)	3.5%	Non-weighted average debt premium in a sample of ERRA and European countries
(c)=(a)+(b)	Return on debt (r_d)	11.0%	Calculated as the sum of the risk free rate and the debt premium
(d)	Equity beta (β)	1	Beta set to 1 due to lack of data based on international comparators
(e)	Equity risk premium (ERP=r_m-r_f)	7.25%	Non-weighted average of a range of equity risk premiums in ERRA and European countries
(f)	Tax rate	15%	Georgian corporate tax rate applicable at the time of WACC calculation
(g)=[(a)+(d)*(e)]/(1-(f))	Return on equity (r_e)	17.4%	Calculated according to the Capital Asset Pricing Model (CAPM)
(h)	Gearing	0.6	Set by secondary legislation (On Approving Electricity Tariff Calculation Methodologies)
(i)=(h)*(c)+(1-h)*(g)	WACC	13.54	Calculated as the Weighted Average between the return on debt and return on equity

The calculation above is in nominal terms and, implicitly, represents the cost of US$-financing given the use of a Eurobond yield to estimate the risk-free rate. Given that the revenues of the various enterprises are denominated in GEL, this would appear to expose them to foreign exchange risks resulting from the mismatch between currencies without any compensating increase in their allowed WACC.

GNERC notes that lack of reliable data, particularly due to the low level of liquidity and capitalization of the Georgian Stock Exchange, imposed a situation where GNERC had to make broad assumptions based on the experience of other countries. This meant a single uniform WACC had to be applied to all regulated companies regardless of their individual borrowing costs or financing structures. On the other hand, the approach is simple, transparent and can be argued to be fair to all parties as the financing costs of regulated utility companies with similar financing structures cannot be expected to differ significantly from one another.

3 Setting the WACC for the forthcoming Regulatory Period

This section of the document presents two different approaches of calculating the Weighted Average Cost of Capital for the forthcoming Regulatory Period:

- **Approach 1a: Estimate an 'efficient' financing cost.** Applying this approach requires reviewing whether GNERC's current assumptions of a risk-free rate of 7.5%, with a debt premium of 3.5% and an equity risk premium of 7.25% are justifiable for the forthcoming Regulatory Period. It should be noted that this would be a practical approach as it is consistent with GNERC policy with which the sector is familiar. It is also a *one-size-fits-all* approach and applies the same cost

of capital to all regulated companies. This can lead to larger discrepancies between allowed and actual cost of capital, than the alternative approach, proposed below.

- **Approach 1b: Estimate an 'efficient' financing cost based on US$ bond risk-free rate.** In this variant, we calculate a WACC which follows the same approach as GNERC at present—ie, a US$-denominated WACC however we adjust the calculation to include an inflation differential to account for the differences in forecast inflation between GEL and USD.
- **Approach 2: Estimate the actual or historic cost of capital incurred by the utilities –** Under this approach the cost of debt is set equal to the actual weighted average cost of debt financing incurred by the regulated utilities. This makes sure that the rate allowed matches their actual debt financing costs, increasing their ability and confidence to invest. Additionally, the gearing ratio is set to equal the actual gearing ratio, so long as the actual ratio is within a certain domain.

This first approach has stronger efficiency incentives as it focuses on the costs of financing the marginal or next investment based on current capital market costs. The second approach reduces the risk that historic or embedded financing costs differ from the allowed cost of capital and, therefore, the potential for licensees to earn windfall gains or losses from the difference.

Implementing the second approach does imply a need for amendments to existing legislation and a more detailed analysis of utility submissions by GNERC staff. The details of this proposal are provided in Section 6 of this Document.

4 Approach 1a: Calculating an "efficient" WACC

4.1 Approach

Under the first approach, the WACC calculation will follow the same principles used by GNERC in setting the allowed return for the first Regulatory Period. The WACC formula is, therefore,

$$WACC = g \cdot r_d + (1 - g) \cdot \left(r_f + \beta \cdot ERP\right)/(1 - t)$$

Where the

$WACC$	is the Weighted Average Cost of Capital
g	is the ratio of debt to the sum of debt and equity
r_d	is the required return on debt
r_f	is the risk-free rate
β	is the covariance between the return of the individual stock of the company with the return of the market
ERP	is the equity risk premium which represents the additional risk investors face in holding equity shares
t	is the corporate tax rate

Each of the WACC inputs will be reviewed based on its reasonableness compared to international comparators. The calculation is conducted in GEL-terms to correct for the foreign exchange risk that exists under the current GNERC calculation.

4.2 Risk-free rate

The calculation is conducted under the assumption that the government's long-term cost of borrowing reflects the best estimate of the risk-free rate. The most recent long-term GEL-denominated bond issue by the Government of Georgia was on 15 February 2017 for a 10-year bond. The auction delivered a weighted average yield on maturity of 11.206%, which is considered to represent the current risk-free rate (rounding to 11.2%).[2]

4.3 Return on debt

The return on debt can be calculated using the following formula

$$r_d = r_f + DRP$$

Where

r_d	is the return on debt
r_f	is the required return on a riskless asset
DRP	is the debt risk premium associated with providing debt to a particular investor

Table 3 shows recent regulatory decisions on the DRP in a number of EnCT countires with similar sovereign credit ratings to that of Georgia. A number appear to apply negative debt risk premiums. It would be difficult to justify regulated utilities having less risk and, therefore, lower yields in Georgia and, for this purpose, negative ERPs are not considered in the calculations. The remaining positive DRPs range from 1% (Croatia) to 4.9% (Montenegro) with an unweighted average of 2.6%. For comparison, the difference in the nominal yield rates between the Georgian Government Bonds and those issued by GWP is 2.8%.

Table 2 *Nominal Yields of Government-issued bonds and Debt Risk Premiums*[3456]

Country	Moody's Rating	Standard& Poor's rating	Currency	Maturity	Nominal Yield	Debt risk-premium
Albania	B1	B+	EUR	2020	5.9%	-1.8%

[2] http://www.mof.ge/en/5024

[3] CRC position paper on WACC values www.crc.bg/files/_bg/Consultation_document_WACC.pdf

[4] CER position paper on WACC values http://www.cer.ie/docs/001043/CER15193%20Europe%20Economics%20Report%20on%20WACC.pdf

[5] AER position paper on WACC values https://www.aer.gov.au/system/files/Final%20decision%20-%20Review%20of%20electricity%20transmission%20and%20distribution%20WACC%20parameters%20-%201%20May%202009.pdf

[6] EnCT study on Allowed Revenues of Signatory Parties https://www.energy-community.org/pls/portal/docs/2768183.PDF

Country	Moody's Rating	Standard& Poor's rating	Currency	Maturity	Nominal Yield	Debt risk-premium
Macedonia	n/a	BB-	EUR	2020	5.1%	-2.4% - -0.4%
Croatia	Ba2	BB	EUR	2023	4.0%	0.6%
Serbia	B1	BB-	USD	2021	6.6%	3.1%
Kosovo	n/a	N/A	EUR	2021	4.0%	3.1%
Montenegro	B1	B+	EUR	2020	4.0%	4.9%
Bulgaria	Baa2	BB+	EUR	2024	3.1%	-0.1%
Georgia	**Ba3**	**BB-**	**GEL**	**2027**	**11.2%**	**3.5%**
GWP			**GEL**	**2017**	**14.0%**	**2.8%**
Ireland	A3	A-				2.0%
Australia	Aaa	AAA				1.8%
					Min	Max
DRP Range					0.6%	4.9%

Taking the minimum and maximum values of the range of positive DRPs, the estimated nominal cost of GEL-denominated debt, expressed as the sum of the risk-free rate and the debt risk premium would lie between 11.8% and 16.1%. However, the upper end of this bound appears rather high when compared with GWP bonds being issued at a premium of less than 3%. Therefore, we apply a range of 0.6% to 3% for the DRP giving an estimated nominal cost of debt of 11.8% to 14.2% with a mid-point of 13.0%.

4.4 Return on equity

Theoretically, there are a number of ways of approaching the return required by equity holders of which the most broadly used are:

- **The Capital Asset Pricing Model (CAPM)** – this is the predominantly used approach by regulatory agencies and research academics[7]. According to this approach, the return required by equity holders should be the sum of the return investors would expect to obtain from risk-free investments plus a premium which is equivalent to the general equity risk premium which compensates for the additional risk of investing in equity markets. The premium is multiplied by an equity beta which aims to determine whether the risk of the particular investment is higher or lower than the general risk faced in equity investments.

[7] Better Regulation – an Explanatory Statement on the Guidelines of Rate of Return published by the Australian Energy Regulator (AER) available at https://goo.gl/BxnyR8

- **Multi-Factor Asset Pricing Models** --- A number of other models, such as the Goldman Sovereign Spread Model, Estrada's Downside Risk Model, the Godfrey and Espinosa Model[8], the Fama-French Three-Factor Model or a range of others can be chosen. Each of these estimates the ERP applying additional explanatory factors to the ERP alone. However, due to the lack of apparent practical or theoretical superiority of those models, considering Georgia's circumstances, it is difficult to justify a diversion from the CAPM approach.
- **Dividend Growth Model (DGM) –** according to the dividend growth model, the return required by equity holders should be the sum of the expected yield from the dividends of the investment and the forecast growth rate of the dividend. Implementing the DGM is difficult in practice as there are many uncertainties about the forecast growth rate[9] in environments with lack of necessary data. DGM finds more application in the US compared to the CAPM which is the most predominantly used model in Europe.

In line with GNERC's previous approach, the CAPM will be used in estimating the return on equity in both alternatives presented below. The CAPM has a strong theoretical basis and is the model in general use internationally. More importantly, as the CAPM appears to be the most frequently used model of ERRA countries and Energy Community Treaty (EnCT) Signatory Parties, it is recommended that this approach is carried forward to the next periodic review in order to be able to compare the reasonableness of GNERC values to those of other countries ERRA and EnCT countries.

$$CAPM = r_f + \beta \cdot (ERP)/(1-t)$$

Where

r_f	is the risk-free rate
β	is the covariance between the return of the individual stock of the company with the return of the market
ERP	is the equity risk premium which represents the additional risk investors face in holding equity shares
t	is the corporate tax rate

The risk-free rate will be the rate established under Section 4.2 above.

The equity Beta is factored into the Capital Asset Pricing Model to enable adjustments for the differences in risk of the individual stock compared to the risk of a diversified portfolio. In a scenario with abundant historical data on companies listed in a liquid stock exchange, the equity Beta would be set by comparing differences between the movements of the stock of a particular company with the movements of the equity market. In such circumstances, one would assess the covariance of the stock return to the market return as an indicator for Beta. A Beta equal to one implies that the risk of the

[8] Gozen, M. (2012), Determining the Cost of Capital for Turkish Electricity Distribution Utilities: Analysis and recommendations, Istanbul University Journal of the School of Business Administration, available at https://www.journals.istanbul.edu.tr%2Fiuisletme%2Farticle%2Fdownload%2F1023018882%2F1023018034&usg=AFQjCNGBOc06U3WdsJdgBpowgL8QvqUnRA

[9] A position paper on the Weighted Average Cost of Capital published by the Energy Regulatory Office (ERO) available at http://www.ero-ks.org/Price%20and%20Tariffs/WACC_Assumptions_FINAL_eng.pdf

individual equity is, on average, the same as the risk of the equity market. A beta higher than one implies higher average risk than the market whereas a beta lower than one implies a lower average risk than the market. In the absence of these data, we have to rely on the experience of other ERRA and EnCT countries and their policy on Betas of regulated monopolies. These data are summarized in Table 3.

The Equity Risk Premium (ERP), representing the additional risk associated with investing in equity markets, were obtained from Damodaran's (2017)[10] ratings based assessment. To assess a country's long-term Equity Risk Premium, Damodaran uses a country's local currency sovereign rating (Moody's) and estimates the default spread as the difference in yield returns of US$ bonds issued by that country and US Treasury bond rates. The total Equity Risk Premium is then calculated as the sum of the risk premium for a mature equity market and the Country Default Spread. The Country Default Spread is then escalated by a multiplier of 1.23, an estimated emerging market average estimated by comparing the ratio of emerging market equity index to an index of emerging market government bonds[11]. The Equity Risk Premium for a mature market, such as the US Market with an *Aaa* Moody's Rating is 5.69%[12]. Damodaran's assessments for Georgia, and other EnCT countries, are summarized in the following table. Damodaran's Equity Risk Premium estimation for Georgia is 10.81%.

It should be noted that this estimate cannot be directly applied to the risk-free rate calculated above as there will be an element of double-counting. Damodaran's estimates are expressed as the addition required to a mature market risk-free rate. Therefore, they include an allowance for the specific default risk of Georgia relative to a mature market such as the USA. However, this same risk is also priced into the cost of sovereign debt of Georgia which represents our assumed risk-free rate.

The Return on Equity component has been calculated using the Bludgeon approach which argues that all companies in a market are equally exposed to country risk[13]. Under this approach the cost of equity is calculated as:

$$r_e = r_f + \beta \cdot MMP + CRP$$

Where MMP is the Mature Market Premium and the CRP is the Country Risk Premium.

Table 3 *ERRA and EnCT countries' Betas and Damodaran's ERP assessments*

Country	Moody's Rating	Equity Beta	Mature Market Premium	Country Default Spread	Country-specific Premium	Total ERP
Albania	B1	1.3	5.69%	5.20%	6.4%	12.09%

[10] Damodaran, Aswath, Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 Edition (March 5, 2016). Available at SSRN: https://ssrn.com/abstract=2742186 or http://dx.doi.org/10.2139/ssrn.2742186

[11] Damodaran, A. Assessment of country risk premiums January 2017 edition available at http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

[12] Damodaran, A. Assessments of Country Risk Premiums available at www.stern.nyu.edu%2F~adamodar%2Fpc%2Fdatasets%2Fctryprem.xls&usg=AFQjCNHkZwKTFdAD6rugZprzFT9DW2Gbgg&sig2=CG_RueiBvJgIM3dx4Q6pdA

[13] Damodaran, A (2003). Measuring Company Exposure to Risk: Theory and Practice

Country	Moody's Rating	Equity Beta	Mature Market Premium	Country Default Spread	Country-specific Premium	Total ERP
Macedonia	n/a	1.0	5.69%	4.16%	5.1%	10.81%
Croatia	Ba2	0.5	5.69%	3.47%	4.3%	9.96%
Serbia	B1	0.7	5.69%	5.20%	6.4%	12.09%
Kosovo	n/a	1.0	5.69%	n/a	n/a	n/a
Montenegro	B1	0.7	5.69%	5.20%	6.4%	12.09%
Bulgaria	Baa2	0.8	5.69%	2.20%	2.7%	8.39%
Georgia	**Ba3**	**1.0**	**5.69%**	**4.16%**	**5.1%**	**10.81%**
Ireland	A3	0.7	5.69%	1.39%	1.7%	7.40%
Australia	Aaa	0.8	5.69%	0.00%	0.0%	5.69%

GNERC staff also expressed interest to look into international experience in differentiating between beta levels of different energy sectors, specifically whether different betas should be applied to gas and electricity networks.

In the following section we provide a broad analysis of market data to see whether European Regulators allow beta levels to vary depending on whether the regulated business is an electricity transmission or distribution or a gas transmission or distribution network.

The analysis suggests European regulators apply a slightly higher premium for Gas networks than for electricity networks (average difference of 0.04)[14].

[14] Council of European Energy Regulator's Report on Investments in European Countries available at http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Cross-Sectoral/2016/C15-IRB-28-03_Investment_Conditions-Report_14-March-2016.pdf

Table 4 *Electricity and gas distribution and transmission betas across a sample of EU countries*

Country	ET beta[15]	ED Beta	GT Beta	GD Beta	ET-ED	GT-GD	Average Electricity - Average Gas	E/G-1
Austria	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0%
Denmark	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0%
Estonia	0.7	0.7	0.7	0.7	0.0	-0.1	0.0	-1%
Finland	0.9	0.5	0.4	0.4	0.3	0.0	0.3	86%
Hungary	0.6	0.6	0.7	0.6	0.0	0.1	-0.1	-20%
Ireland	0.7	0.7	0.9	0.9	0.0	0.0	-0.2	-22%
Italy	0.6	0.6	0.6	0.6	0.0	-0.1	0.0	-2%
Lithuania	0.7	0.7	1.9	1.9	0.0	0.0	-1.2	-62%
Luxembourg	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0%
Netherlands	0.8	0.8	0.8	0.8	-0.1	0.0	0.0	-1%
Poland	0.8	0.8	0.5	0.5	0.0	0.0	0.3	54%
Portugal	0.6	0.7	0.6	1.2	-0.1	-0.6	-0.2	-27%
Sweden	0.6	0.6	0.8	0.8	0.0	0.0	-0.1	-18%
Slovenia	1.1	1.1	0.9	0.9	0.0	0.0	0.2	23%
UK	0.9	0.9	1.0	0.9	0.0	0.0	0.0	-2%
Average beta	0.8	0.8	0.8	0.8	0.0	0.0	-0.04	-5%

With the exception of Poland, Finland and Slovenia, the gas networks betas are higher than or equal to the electricity networks betas. The average difference between betas of electricity networks and those of transmission networks, expressed in relative terms, is -5%.

Before interpreting the meaning of the above-findings to Georgian beta policy, one must bear in mind that differences in policies towards beta for these different sectors depend on many factors, which are not solely related to the nature of the business but to policy decisions which are outside of the regulated company's control. The individual regulatory policy applicable to each sector, allowances for incentive gains, predictability and stability of the regulatory framework, perceived credibility of the regulatory agency all affect the value of the beta. A more thorough analysis of GNERC's regulatory policies towards gas and electricity networks as well as the relative risk exposure between these two

[15] ET, ED, GT, GD mean Electricity Transmission, Electricity Distribution, Gas Transmission and Gas Distribution, respectively

sectors is required in order to provide evidence to suggest that GNERC's beta policy towards these sectors should divert from the current one. European regulators also appear to apply similar policies towards network betas, with values converging to an average beta value of 0.8 across electricity and gas distribution and supply. These policies appear to be more consistent in the electricity distribution network beta (standard deviation of 0.1) than on the gas transmission and distribution networks (standard deviation of 0.4).

The water sector, on the other hand, is generally considered to be exposed to relatively less risk with more long-term customer demand forecasts and steadier forecast income. As a result, we see that regulators in UK and Australia typically apply lower Beta values for water companies compared to their electricity and gas counterparts. An Economic Consulting Associates report to Ofwat on behalf of the Consumer Council for Water indicated beta values of 0.5 to 0.6 for the 2015-2020 Regulatory Period[16]. Estimated equity betas for three utility companies range from 0.49 to 0.54, considerably lower than beta values for electricity and gas distribution and transmission networks in Table 4. On the other hand, regulated generators are exposed to relatively higher risk than electricity and gas distribution and transmission utilities. This exposure is likely to become more apparent as Georgia becomes a Signatory Party of the Energy Community Treaty, whereby regulated wholesale tariffs would be expected to be phased out. The broad analysis displayed above suggests an equity beta of 0.8 for regulated gas and electricity networks might be appropriate, with a slight downwards adjustment for water utilities and an upwards adjustment for regulated generators.

A summary of beta values applied by Australian and UK regulators is provided in the following table.

Table 5 *Water sector Betas applied by Australian and UK regulators*

Country	Regulator	Year	Company	Company
Australia[17, 18]	IPART	2016	Sydney Water	0.6-0.8
			Melbourne Water	0.65
			Golbourn Murray Water	0.7
			SA Water	0.7
		2013	Gosford City Council	0.6-0.8
		2013	Hunter Water Corporation	0.6-0.8
		2012	Sydney Catchment Authority	0.6-0.8
		2012	Sydney Water Corporation	0.6-0.8
		2011	Sydney Desalionation Plant	0.6-0.8
	ESC	2013	Greater metropolitan water businesses	0.65
			Regional urban water businesses	0.65
			Rural water businesses	0.65 or 0.7
	ERA	2013	Water Corporation, Aqwest and Busselton Water	0.65
	ESCOSA	2013	SA Water	0.8
	QCA	2013	Seqwater's Supply Schemes	0.55

[16] An Economic Consulting Associates Report providing Ofwat with Recommendations for the Weighted Average Cost of Capital 2015-2020 available at https://www.ccwater.org.uk/wp-content/uploads/2014/07/ECA-CCWater-Cost-of-Capital-summary-report.pdf

[17] A 2016 report on IPART WACC estimates for Australian Water utilities available at http://www.synergies.com.au/wp-content/uploads/2016/08/Client-brief-water-price-decisions_010816.pdf

[18] An AER report on WACC levels set by Australian regulators available at https://www.aer.gov.au/system/files/AER%20-%20equity%20beta%20issues%20paper%20-%20rate%20of%20return%20guideline%20-%20October%202013.PDF

		2012	SunWater's water supply Schemes	0.55
		2010	Gladstone Area Water Board	0.65
UK[19]	Ofwat	2008	Pennon Group	0.63
			Severn Trent	0.64
			United Utilities	0.65
			Dee Valley	0.72
UK	Ofwat	2013	Pennon Group	0.7
			Severn Trent	0.51
			United Utilities	0.58
			Dee Valley	0.37

4.5 Gearing

GNERC currently maintains a gearing ratio of 60% which is within the range of generally accepted optimal financing structures.

Table 6 *A comparison of GNERC's gearing level assumptions to international practice*

Country	Moody's Rating	Standard& Poor's rating	Transmission business	Distribution business
Macedonia	n/a	BB-	53.4%[20]	60.7%[21]
Kosovo	n/a	n/a	n/a	40%[5]
Croatia	Ba2	BB	n/a	50%[22]
Montenegro	B1	B+	50%[5]	50%[5]
Albania	B1	B+	n/a	60%[5]
Serbia	B1	BB-	60%[5]	n/a[5]
Ireland	A3	A-	55%[23,24]	55%[8,9]

[19] A PwC report to Ofwat on Company-specific adjustments to the WACC available at https://www.ofwat.gov.uk/wp-content/uploads/2015/10/rpt_com1408pwcuplift.pdf

[20] An Energy Community Report on the status of the main criteria for Allowed Revenue Determination for Transmission, Distribution and regulated supply of electricity and gas available at https://www.energy-community.org/pls/portal/docs/2768183.PDF

[21] The Decision of the Energy Regulatory Commission of the Republic of Macedonia available in Macedonian language only at http://www.erc.org.mk/odluki/5.%20%20EE-C-2011.12.30-%20EVN%20DISTRIBUCIJA%20KONECNA%20ODLUKA%20ZA%20PRIHOD%20I%20CENA.pdf

[22] The Croatian Energy Regulatory Agency's (HERA) decision on Tariff Elements for a gas company available in Croatian at https://www.hera.hr/hr/docs/2016/Odluka_2016-12-16_10.pdf

[23] A review of WACC parameters for Irish Transmission and Distribution electricity networks by Europe Economics available at http://www.cer.ie/docs/001043/CER15193%20Europe%20Economics%20Report%20on%20WACC.pdf

[24] The Commission of Energy Regulation (CER) of the Republic of Ireland's decision paper on Mid-Term review of WACC parameters for Transmission and Distribution networks for 2014 to 2015 available at http://www.cer.ie/docs/000801/CER14026%20WACC%20Review%20Decision%20Paper%20Final.pdf

Country	Moody's Rating	Standard& Poor's rating	Transmission business	Distribution business
UK	Aa1	AA	60%[25]	60%
Australia	Aaa	AAA	60%[26]	60%

Based on the above observation, there appears to be no evidence to suggest that GNERC should divert away from its current policy. For comparison, however, a range of WACC depending on the WACC values applied in other countries is provided in 4.6.

4.6 Estimated WACC

The estimated WACC under this approach is shown below. Given the uncertainties over precise values, a range with minimum, maximum and mid-point values is presented. While there may be a temptation to choose the mid-point, all values within this range are equally valid. The decision on the final WACC needs to balance the financing cost against other elements of the final price control to ensure a reasonable risk-return balance is achieved.

Table 7 *Estimated WACC under efficient utility assumption*

Methodology	WACC Input	New Min	New Mid	New Max
(a)	Risk-free rate (r_f)	11.2%	11.2%	11.2%
(b)	Default spread	4.2%	4.2%	4.2%
(c)	Debt Premium (d_p)	0.6%	1.8%	3.0%
(d)=a+c	Return on debt (r_d)	11.8%	13.0%	14.2%
(e)	Equity beta (β)	0.54	0.86	1.32
(f)	Mature Market Premium	5.7%	5.7%	5.7%
(g)	Country Risk Premium	5.1%	5.1%	5.1%
(h)=a-b+e*f+g	Post-tax cost of equity	15.2%	17.1%	19.7%
(i)	Tax rate	15.0%	15.0%	15.0%
(j)=h/(1-i)	Return on equity (r_e)	17.9%	20.1%	23.1%

[25] The Office of Gas and Electricity Market of the United Kingdom's Final Proposals for National Grid Electricity Transmission and National Grid Gas available at https://www.ofgem.gov.uk/ofgem-publications/53602/4riiot1fpfinancedec12.pdf

[26] The Australian Energy Regulator's Electricity Transmission and Distribution service providers Review of Weighted Average Cost of Capital (WACC) parameters available at https://www.aer.gov.au/system/files/Final%20decision%20-%20Review%20of%20electricity%20transmission%20and%20distribution%20WACC%20parameters%20-%201%20May%202009.pdf

(k)	Gearing	0.6	0.6	0.6
(l)=d*k+j*(1-k)	WACC	14.3%	15.8%	17.8%

5 Approach 1b: Calculating an efficient WACC in US$-terms

5.1 Approach

Under this approach, the calculation is conducted by making reference to the US$-risk-free rate and adjusting for the country risk premium and inflation differential. This changes the risk-free rate but all other elements of the calculation remain as under Approach 1a.

5.2 Risk-free rate

GNERC estimated the risk-free rate using the yield on US$-denominated government bonds at issuance in 2011. However, there have been no further issues since that date meaning that those values are now outdated.

Therefore, a revised risk-free rate in US$ terms is estimated as the sum of the US risk-free rate plus the country risk premium of 4.16% for Georgia (as estimated by Damodaran and reported in **Table *3***).

The current yield on 10-year US Treasury bonds has been used as the US risk-free rate. This is 2.43%[27]. The resulting estimated risk-free rate for Georgia in US$-term is, therefore, 6.59%. This is somewhat lower than the yield actually seen in 2011 which most likely reflects the global decline in yields since then.

The US$ yield is adjusted to reflect the inflation differential between USD forecast inflation and the Georgian Ministry of Finance forecast CPI[28]. A geometric average is used to calculate the change between 2016 and 2020. The resulting inflation differential is 0.71% and the resulting final risk-free rate to be used under this scenario is 7.30%.

5.3 Estimated WACC

The estimated WACC using approach 1b is provided below.

Table 8 *Estimated WACC under approach 1b*

Methodology	WACC Input	New Min	New Mid	New Max
(a)	Risk-free rate (r_f)	2.43%	2.43%	2.43%
(b)	Inflation differential	0.71%	0.71%	0.71%

[27] https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

[28] Forecast inflation consistent with an IMF World Economic Outlook report available at https://www.google.ge/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiRhumz2bTSAhWoLcAKHYWACIgQFggeMAA&url=https%3A%2F%2Fwww.imf.org%2Fexternal%2Fpubs%2Fft%2Fweo%2F2015%2F02%2Fpdf%2Ftext.pdf&usg=AFQjCNE0ef9Hc_5KMi5tR_IYvxDSw41WSQ

(c)	Default Spread	4.16%	4.16%	4.16%
(d)	Debt Premium (d_p)	0.6%	1.8%	3.0%
(e)=(a+b+c+d)	Return on debt (r_d)	7.90%	9.10%	10.30%
(f)	Equity beta (β)	0.54	0.86	1.32
(g)	Mature market premium	5.7%	5.7%	5.7%
(h)	Country Risk Premium	5.1%	5.1%	5.1%
(i)=(a+b+d+f*g+h)	Post-tax cost of equity	11.3%	13.1%	15.8%
(j)	Tax rate	15%	15%	15%
(k)=(i)/(1-j)	Pre-tax cost of equity	13.32%	15.47%	18.55%
(l)	Gearing	0.6	0.6	0.6
(m)=l*e+(1-l)*k	WACC	10.1%	11.6%	13.6%

6 Approach 2: Calculating the WACC using actual costs

6.1 Approach

The calculation above follows GNERC's approach in estimating the efficient cost of financing for a generic commercial utility. The alternative is to use the actual cost of financing for each individual utility. This should ensure that the allowed WACC tracks actual financing costs for the utility, thereby avoiding it making windfall profits or losses from differences between allowed and actual costs. However, it also has a number of disadvantages, which GNERC will need to consider when deciding which approach to adopt:

- It requires a separate assessment and decision to be made for each regulated utility, which creates additional workload for GNERC;
- It provides no incentives for the utilities to look to minimize their financing costs;
- It may make it harder for the utilities to raise commercial and/or foreign currency-denominated debt in future if the allowed WACC based on current actual costs is far below the costs of such commercial debt;
- It may encourage government to use decisions on WACC and, in particular, on the return on equity as a hidden subsidy to customers.

By its nature, the calculation of a WACC based on actual financing costs will require data for individual utilities. An illustration of how this calculation can be undertaken is illustrated below, using the most

recent financial statements (in English) published for Georgian State Electrosystem (GSE)[29]. A similar calculation would need to be undertaken, albeit with much deeper assessment of the efficiency of procurement for capital investment projects, for each utility.

It should be noted that GSE is a wholly state-owned enterprise (SOE) and the calculation of the return on equity below reflects this. If calculating the WACC on this basis for a private enterprise then the appropriate return on equity to apply would be that estimated above in Section 4.4.

6.2 Cost of debt

GSE total long-term loans in 2015 were GEL 698 million[30]. Total interest costs, including capitalized interest during the year were GEL 23 million[31]. The implied average interest cost is, therefore, 3.2%.

However, GSE's long-term debt appears to be entirely denominated in Euros (87.3%) and US$ (12.7%). Therefore, the assumed cost of debt should also allow for the resulting risk of foreign exchange losses. This cost has been estimated as the projected difference between the weighted Eurozone and US inflation rates and that of Georgia for the next five years, assuming that exchange rates depreciate so as to maintain a constant real exchange rate[32].

The resulting premium to compensate for foreign exchange risks is estimated at 1.3% giving a total cost of debt of 4.5%.

This estimated cost is obviously far below our estimate of a commercial cost of debt, as set out in Section 4.3. The difference can be explained by GSE's long-term debt being entirely in the form of concessional loans from KfW, EIB, EBRD, ADB and the World Bank. It should be noted that, in setting a commercial WACC, GNERC is essentially preventing the benefits of this concessional debt being passed to electricity customers in the form of lower tariffs. This is one of the disadvantages of assuming a commercial financing cost and a single WACC for all utilities in an environment such as Georgia.

6.3 Return on equity

The return on equity for a SOE is inherently subjective. In the absence of a Government policy on expected returns to be earned, there are two main approaches to setting the return on equity:

- Assume that SOEs should earn a return commensurate with that of commercial entities. This would be consistent with a policy that entities providing commercial services should earn similar returns irrespective of ownership. It also provides a stream of revenue for government that can be directed to social services and other noncommercial uses.
- Assume that SOEs should earn a return at least equal to the opportunity cost of the capital invested by government in the utility. This is represented by the government's cost of

[29] The financial statements are for 2015 and are contained in GSE's Annual Report (http://www.gse.com.ge/sw/static/file/2015_GSE_Annual_Report_eng..pdf)

[30] Calculated as the average of opening and closing balances of non-current liabilities and the current portion of long-term loans (see Note 13 to the financial statements).

[31] See Note 5 to the financial statements.

[32] Projected Consumer Price Index (end-of-year) for 2016-21, as reported in IMF World Economic Outlook, October 2015 (). Eurozone inflation is proxied by German CPI. A geometric average has been calculated. The respective projected inflation rates are: Eurozone (Germany) – 1.8%, USA – 2.5%, Georgia – 3.2%.

borrowing—as the invested capital that is not redeployed for other purposes will need to be replaced from new government borrowing.

The latter approach is used for the example calculation, assuming that GSE should earn a return on equity equal to the yield on long-term government bonds (set at 11.2%, as discussed in Section 4.2). We do not adjust for tax as, from the government's perspective, the difference between earning income from GSE as dividends and as tax is immaterial.

6.4 Gearing

There are two alternative ways of calculating the gearing of GSE for the purposes of estimating financing costs. The first is a simple comparison of the value of equity and value of long-term debt. The second is a comparison of the share of long-term debt in total net fixed assets with the difference being assumed to represent the contribution made by equity owners to build these. The two will frequently differ where, as is the case for GSE, the entity has been making operating losses which must also be covered from equity (in the form of reductions in the book value of equity).

The two estimates are shown below.

Table 9 *Estimates of GSE's gearing*

	Long-Term Debt (GEL million)	Equity / Net Fixed Assets (GEL million)	Gearing
Debt : Equity	769,766	153,021	0.83
Debt : Net Fixed Assets	769,766	n/a	0.76

As we are interested in GSE's financing of investments, the second of these values is used (debt relative to net fixed assets).

6.5 Estimated WACC

An estimation of the actual cost of capital of GSE is provided below.

Table 10 *Estimated WACC using actual financing costs (GSE)*

WACC Input	Actual Financing Cost – GSE (GEL)
Return on debt (r_d)	4.5%
Return on equity (r_e)	11.2%
Gearing	0.76
WACC (nominal)	6.1%

6.6 Required legislative amendments

Should GNERC opt to introduce this approach to its regulatory policy, certain amendments to Resolution No. 14 Resolution No. 14 "On Approving Electricity Tariff Calculation Methodologies" would be required. These amendments broadly need to cover:

- Introducing a floating gearing ratio which matches the actual financing structure of the regulated company. This should be done in order to enable the allowed WACC to reflect the capital structure of the regulated utility as closely as possible. GNERC ensures that companies are not incentivized to move out of the domain of sustainable gearing levels. GNERC can state, therefore, that the actual gearing levels can be accepted so long as it is between a domain of gearing levels which GNERC considers optimal. This will provide a strong incentive to the companies to stay within optimal gearing levels.
- Introducing a provision to state that the cost of debt is set equal to the weighted average cost of debt incurred by the licensee over a period set by the Regulator. This needs to be accompanied by a provision to ensure that GNERC retains the right to exclude a loan from the calculation if GNERC reasonably considers that the level of the loan exceeds the prevailing market interest rates.

7 Comparison of approaches

A comparison of the resulting WACC assessments is provided below.

As can be seen, the efficient financing approach this gives a slightly higher estimated WACC (for the mid-point of the calculated range) than that currently applied by GNERC. The difference can be largely explained by the higher risk-free rate used which represents the additional premium for GEL over US$-denominated financing. As discussed earlier in this paper, if the utilities face a mismatch between the currencies in which they receive revenues and pay financing costs then this will need to be compensated through one means or another. In this calculation, this is done by using a GEL-denominated risk-free rate which then captures the additional costs associated with expected depreciation of the GEL relative to the US$.

An alternative calculation is provided in approach 1b where the US$ 10 year Treasury bond yield to maturity is used as the risk-free rate. The value is adjusted upwards to reflect Damodaran's country risk premium for Georgia. An additional adjustment is made to compensate for the difference between forecast USD and GEL inflation rates. The resulting Rf rate is 7.3%.

For comparison, an actual calculation of cost of capital is illustrated based on data presented by GSE. This is clearly much lower. The choice between whether to use an efficient utility calculation or to use actual costs depends on many other factors than level alone, however, as briefly discussed in Section 6.1.

8 Annex 1: Overview of Damodaran's principles of estimating risk premiums

This section of the document provides an overview of the approaches used by Damodaran[33] in estimating the equity risk premiums for estimating the cost of equity in different countries.

Damodaran starts with the basic proposition that the Equity Risk Premium in any country can be estimated as the sum of a mature country equity risk premium and the additional country risk premium which is dependent on the country for which the equity value is being estimated.

The mature country equity risk premium is estimated using the implied equity risk premium approach. Under this approach, Damodaran estimates potential dividends that could be paid using the free cash flow to equity as an indicator to potential dividends. The implied premium is calculated by netting out the rate on a 10-year US T-bond from yield expected by investors for the expected cash flows based on current prices. The current risk premium for a mature equity market (as of January 5 2017) used in the WACC calculations in this paper is 5.69%.

The additional country risk premium is then estimated in one of three ways:

- Country default spread on a sovereign bond or the CDS Market;
- Average spread on a bond;
- Ratings-based (imputed spread) assessment.

Under the first approach, Damodaran determines the spread by comparing the yields in bonds issued by the foreign country in the currency where there is a default-free bond. In this case, the spread would be calculated by netting out the yield of a 10-year US$ Treasury bond from the yield of the 10-year USD-denominated bond in the country analyzed. Alternatively, the spread can be assessed based on the Credit Default Swap (CDS) market, where investors purchase protection for potential defaults of their securities.

Under the second approach, Damodaran determines the spread as an average default spread over a prolonged period rather than the value of the default spread at the moment of the assessment. This approach is more appropriate if there are volatility concerns on the returns on securities.

The above approaches can only be applicable if the country being analyzed has issued bonds denominated in US$ or other default-free currencies, which is not the case for many emerging market countries. For such countries, in his third approach, Damodaran allocates a country risk based on the average spread of countries with the same rating based on data obtained from the CDS market. The country risk premium applicable for Georgia, in the above calculations, has been estimated according to the third approach. The spread assessment amounts to 4.16%.

[33] Damodaran, A. (2016), Country Risk: Determinants, Measures and Implications – The 2016 Edition.

9 Annex 2: Summary of calculations and rationale for Approach 1a

Methodology	WACC Input	Current Level	New Min	New Mid	New Max	Rationale
(a)	Risk-free rate (r_f)	7.5%	11.2%	11.2%	11.2%	The most recent long-term GEL-denominated bond issue by the Government of Georgia (15 February 2017)
(b)	Default spread	0.0%	4.2%	4.2%	4.2%	Damodaran ratings-based assessment for Georgia
(c)	Debt Premium (d_p)	3.5%	0.6%	1.8%	3.0%	Debt risk premiums set by a sample of countries
(d)=a+c	Return on debt (r_d)	11.0%	11.8%	13.0%	14.2%	Sum of risk free rate and debt risk premium
(e)	Equity beta (β)	1	0.54	0.86	1.32	Betas set by a sample of countries
(f)	Mature Market Premium		5.7%	5.7%	5.7%	Damodaran estimation of a Mature Market Premium for the US
(g)	Country Risk Premium		5.1%	5.1%	5.1%	Damodaran estimation of country risk premium for Georgia
(h)=a-b+c+e*f+g	Post-tax cost of equity		15.2%	17.1%	19.7%	Post tax cost of equity
(i)	Tax rate	15.0%	15.0%	15.0%	15.0%	Tax rate applicable in Georgia
(j)=h/(1-i)	Return on equity (r_e)	17.4%	17.9%	20.1%	23.1%	Pre-tax cost of equity
(k)	Gearing	0.6	0.6	0.6	0.6	Set by secondary legislation (On Approving Electricity Tariff Calculation Methodologies)
(l)=d*k+j*(1-k)	WACC	13.5%	14.3%	15.8%	17.8%	Calculated as the Weighted Average between the return on debt and return on equity

10 Annex 3: Summary of calculations and rationale for Approach 1b

Methodology	WACC Input	Current Level	New Min	New Mid	New Max	Rationale
(a)	Risk-free rate (r_f)	7.50%	2.43%	2.43%	2.43%	10-year US Treasury Bond Yield Rate
(b)	Inflation differential		0.71%	0.71%	0.71%	Comparing US$ and GEL forecast inflation according to Ministry of Finance
(c)	Default Spread		4.16%	4.16%	4.16%	Damodaran ratings-based assessment for Georgia
(d)	Debt Premium (d_p)	3.50%	0.6%	1.8%	3.0%	Debt risk premiums set by a sample of countries
(e)=(a+b+c+d)	Return on debt (r_d)	11.00%	7.90%	9.10%	10.30%	Sum of risk free rate and debt risk premium
(f)	Equity beta (β)	1	0.54	0.86	1.32	Betas set by a sample of countries
(g)	Mature market premium		5.7%	5.7%	5.7%	Damodaran estimation of a Mature Market Premium for the US
(h)	Country Risk Premium		5.1%	5.1%	5.1%	Damodaran estimation of country risk premium for Georgia
(i)=(a+b+d+f*g+h)	Post-tax cost of equity		11.3%	13.1%	15.8%	Post tax cost of equity
(j)	Tax rate	15%	15%	15%	15%	Georgian corporate tax rate applicable at the time of WACC calculation
(k)=(i)/(1-j)	Pre-tax cost of equity	17.35%	13.32%	15.47%	18.55%	Pre-tax cost of equity
(l)	Gearing	0.6	0.6	0.6	0.6	Set by secondary legislation (On Approving Electricity Tariff Calculation Methodologies)
(m)=l*e+(1-l)*k	WACC	13.5%	10.1%	11.6%	13.6%	Calculated as the Weighted Average between the return on debt and return on equity

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