Performance Based Regulation of Philippines Electricity Distribution Companies

REGULATORY TRAINING COURSE

Cebu – November 5 & 6, 2007
Baguio – November 8 & 9, 2007

SESSION 3A – DIVERSE REGULATORY FACTORS & INDICES

Overview of the session

- This session will cover:
  - The regulatory weighted-average cost of capital (WACC)
  - Construction work in progress
  - Working capital
  - Calculating the rolled-forward RAB
  - Economic indices

Regulatory Weighted Average Cost of Capital (WACC)

- The WACC is the rate of return used in:
  - The return on capital building-block calculation
  - The calculation of the X-factor
  - Calculating the allowance for construction work in progress (CWIP)
- It is one of the critical parameters for PBR
  - A relatively small variance in WACC can have substantial impact on allowed revenue and price caps
- Unfortunately, it is also a somewhat uncertain parameter:
  - The calculation is straightforward, but
  - Determination of the underlying factors on which it is based, varies
  - Some of these factors not directly observable, can be contentious
- It is usually a quite stable parameter, varying only gradually
  - However, changes seen recently with changing economic fortunes
  - Underlying parameter (real WACC) still stable

Regulatory Weighted Average Cost of Capital (WACC)

- WACC used in the RDWR is the "vanilla WACC"
  - Based on nominal income, post-tax income stream
    - Hence allows for corporate income tax as a recoverable expense
  - As opposed to pre-tax WACC (real or nominal)
    - Does not allow corporate tax building block
    - Compensates through higher discount rate
  - As opposed to post-tax WACC (real or nominal)
    - Allows corporate tax building block
    - Assumes a taxation regime that does not provide for dividend imputation (effectively same corporate and personal tax rates on dividends & interest)
- A detailed description of the calculation of the regulatory WACC is provided in ERC publication:

  "*Final Calculation of the Regulatory Weighted Average Cost of Capital that shall apply during the Second Regulatory Period : First Entry Group*" August 15, 2007

Regulatory Weighted Average Cost of Capital (WACC)

The formula:

$$WACC = r_e\left(\frac{E}{V}\right) + r_d\left(\frac{D}{V}\right)$$

where

r_e	=	*cost of equity*
r_d	=	*cost of debt*
E	=	*proportion of equity funding in the utility capital structure, set at 55% of V for the 2nd Regulatory Period*
D	=	*proportion of debt funding in the utility capital structure, set at 45% of V for the 2nd Regulatory Period*
V	=	*D + E*

- Note that the D:E ratios are based on that for a hypothetical, efficient utility
    - This is unlikely to correspond with the actual ratio of the utility
    - We deal here with the <u>regulatory</u> WACC, not a firm's actual WACC

Regulatory Weighted Average Cost of Capital (WACC)

Continuing the formulas:

$r_d \quad = \quad r_f + \textit{Debt Margin}$

$r_e \quad = \quad r_f + \beta_e \times MRP$

Where

$r_f \quad = \quad$ *Risk-free rate for the Philippines*

$\beta_e \quad = \quad$ *Equity beta (systemic or non-diversifiable risk of an investment)*

$MRP =$ *Market risk premium* $(r_m - r_f)$*, set at 6%*

$r_e \quad = \quad r_f + \beta_e \times MRP$ is the Capital Asset Pricing Model (CAPM)

- Based on premise that the return on equity for a particular share:
  - Is correlated to overall market return through beta-factor
  - Beta factor reflects the non-diversifiable risk of the share
- No compensation for unique risks – these can be eliminated through adopting a diversified portfolio

Regulatory WACC – The Parameters

<u>The risk-free rate</u>

- Normally calculated as:
  - Direct measure – yields on long-dated Philippines treasury bonds
  - Indirect measure – yields on long-dated USA treasury bonds, adjusted for inflation differential between USA & Philippines, and Philippines country risk
- Direct measure has proved problematic in the Philippines
  - 10-Year Philippines treasury bonds appear most appropriate measure
  - However, evidence of very low liquidity and lack of trading in these bonds
  - Also illustrated by difference in yield of 5-year bonds
- Indirect measure relies on estimates of
  - USA risk-free rate
  - USA treasury bond yield
  - USA inflation rate
  - Philippines inflation rate
  - Country risk premium

Regulatory WACC – The Parameters

The risk-free rate (cont.)

- Indirect measure :

$$r_f = \left[\frac{(1 + r_{f\,USA})}{(1 + i_{CPI\,\mathrm{USA}})} \right] (1 + i_{CPI})(1 + CRP) - 1$$

- Country risk premium can be based on
  - Yield curve difference between Philippine treasury bond data and US$ denominated bonds traded in the Philippines
  - Average yield difference by maturity
  - Independent data sources (such as PwC, UK)
- For final determination for Group A:
  - ERC concluded that indirect method is most appropriate, using country-risk premium established through independent data source
  - Lack of liquidity precludes direct method

Regulatory WACC – The Parameters

<u>Equity beta (β_e)</u>

Not readily observable in Philippines – lack of listed electricity utilities

- Meralco only listed utility – but resembles vertically integrated business, not pure distribution utility

– Therefore rely on beta observed for overseas utilities

– Observed companies have different gearing ratios to that specified

– Have to de-lever observed figures to obtain asset beta

$\beta_a = \beta_e \ / \ [1 + (1 – T_e) \ x \ D_m / E_m]$ (Hamada formula)

– Re-lever to ERC specified equity beta

$\beta_e = \beta_a \ / \ [1 \ x \ D / E]$ (Harris-Pringle formula)

– To obtain proxy for local $\beta_{e,}$ ERC relies on

- Bloomberg data (for international distribution utilities)
- Research data from Stern University
- Information sourced from comparative overseas regulatory decisions

Regulatory WACC – The Parameters

Debt Margin

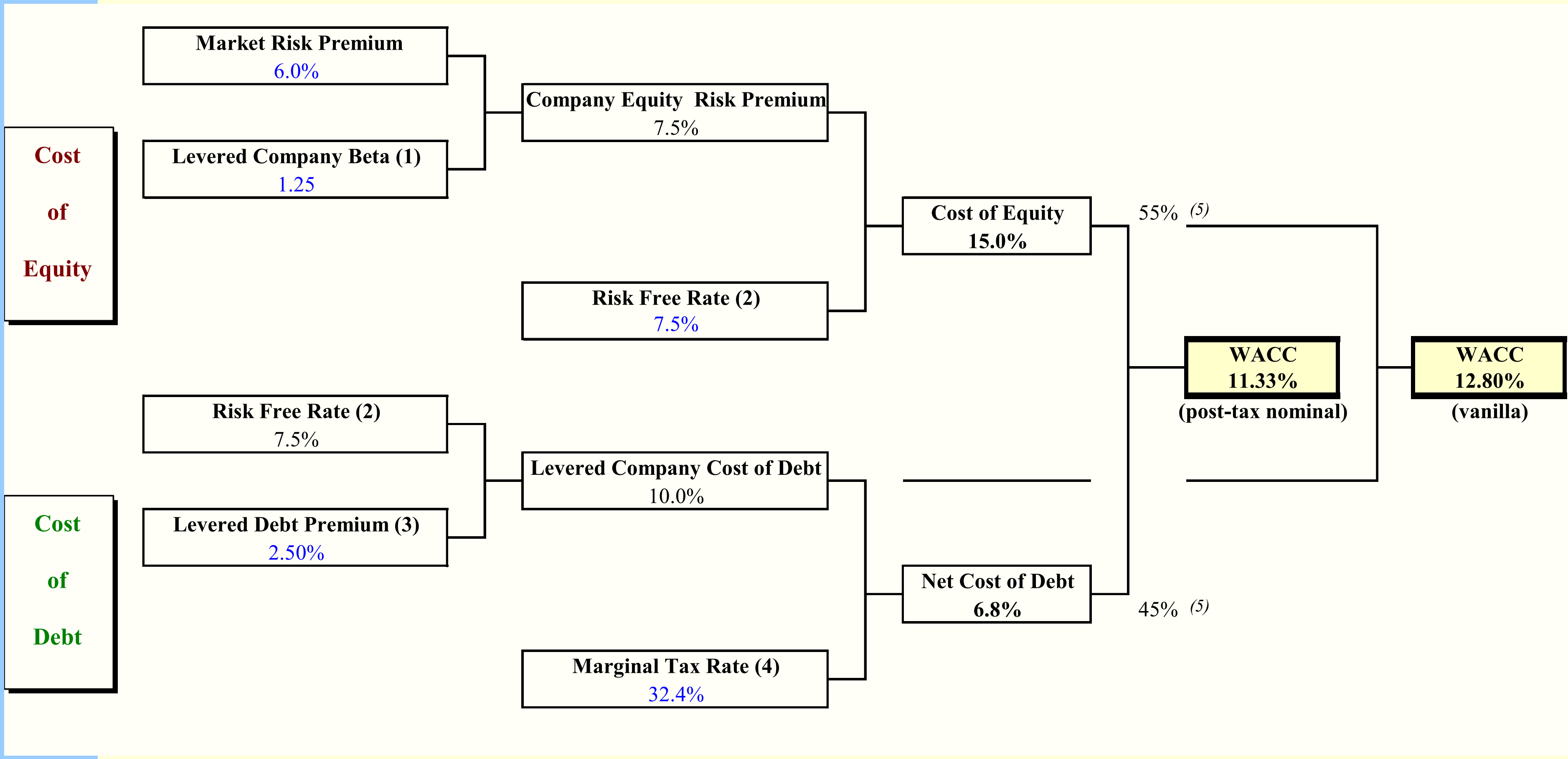
- RDWR requires industry-average debt-margin
  - Feedback that debt is harder to arrange (more expensive) for smaller utilities
  - However, decision based on hypothetical, efficient company – that includes efficient size
- Research done on Partial Risk Guarantees to determine risk premium
- ERC considers risk premium for distribution utilities somewhat higher than for transmission utilities

Regulatory WACC – The Parameters

<u>Corporate tax rate</u>

- EVAT Law passed by Congress:
  - Corporate tax rate is 35% up to 2008
  - Then 30% p.a.
- Effective tax rate for 2nd Regulatory period is 32.37% (applying DCF approach)
- Note, tax rate plays no role in Vanilla WACC
  - Is required to calculate post-tax of pre-tax WACC

Regulatory WACC – The Decision for Group A (August 2007)



Regulatory WACC – The Decision for Group A (August 2007)

Group 1 DU Regulated WACC Estimate - Base on Peso Debt Financing				
WACC Calculation Worksheet				
Input only in shaded cells				
		Regulatory WACC Estimate by ERC		
Paramaters		***Low***	***Mid***	***High***
Gearing (Debt) ratio	D/(D+E)	50%	45%	50%
Equity ratio	E/(D+E)	50%	55%	50%
Debt to Equity	D/E	1.00	0.82	1.00
Asset beta (degeared empirical beta)	$ß_a$	0.683	0.688	0.693
Risk free rate (nominal - US$ 10 Year Bond Yields in USA)		4.85%	5.10%	5.35%
Country Risk Margin (excluding FX Risk)	CRP	2.45%	2.70%	2.95%
Risk free rate used in WACC	R_f	7.03%	7.55%	8.07%
Debt Margin	DM	2.25%	2.50%	2.75%
Cost of debt (pre-tax nominal peso terms)	$\mathbf{K_d}$	**9.28%**	**10.05%**	**10.82%**
Market Risk Premium (Developed Country)	$R_m - R_f$	6.00%	6.00%	6.00%
Corporate tax rate	t_c	32.4%	32.4%	32.4%
Inflation rate (Philippines)	i	1.82%	2.32%	2.82%
Inflation Rate (USA)		2.19%	2.69%	3.19%
Calculated Equity (Regeared) Betas	***Formula***	***Low***	***Mid***	***High***
Equity Beta (1) Simple No Tax Adjustment	1	1.37	1.25	1.39
Equity Beta (2) Simple Tax Adjustment	2	1.14	1.07	1.16
Other Parameters				
Equity beta (geared beta)	$ß_e$	1.37	1.25	1.39
Cost of Equity (post-tax nominal)	$\mathbf{K_e}$	**15.22%**	**15.05%**	**16.38%**
WACC Matrix - Commercial Practice				
Post-tax nominal		**10.75%**	**11.33%**	**11.85%**
Post-tax real		8.77%	8.81%	8.78%
Pre-tax nominal		15.89%	16.76%	17.52%
Pre-tax real		**13.82%**	**14.11%**	**14.30%**
Vanilla WACC (nominal)		**12.25%**	**12.80%**	**13.60%**

Regulatory WACC – The Decision for Group A (August 2007)

- The WACC for Group A has changed unusually from 2006
  - Late 2006 (based on TransCo decision) : 16.07%
  - Now 12.8%
- Impact of rapidly improving economic parameters (as shown before)
- Some questions to ponder therefore:
  - What is the likelihood for these changes to be reversed?
  - Should the WACC for all entry groups be the same?
- Also, remember that this is a nominal WACC, which fluctuates with inflation
  - The real WACC, is more consistent over time
  - Lower(/higher) nominal return appropriate in periods of lower(/higher) inflation

Construction work in progress

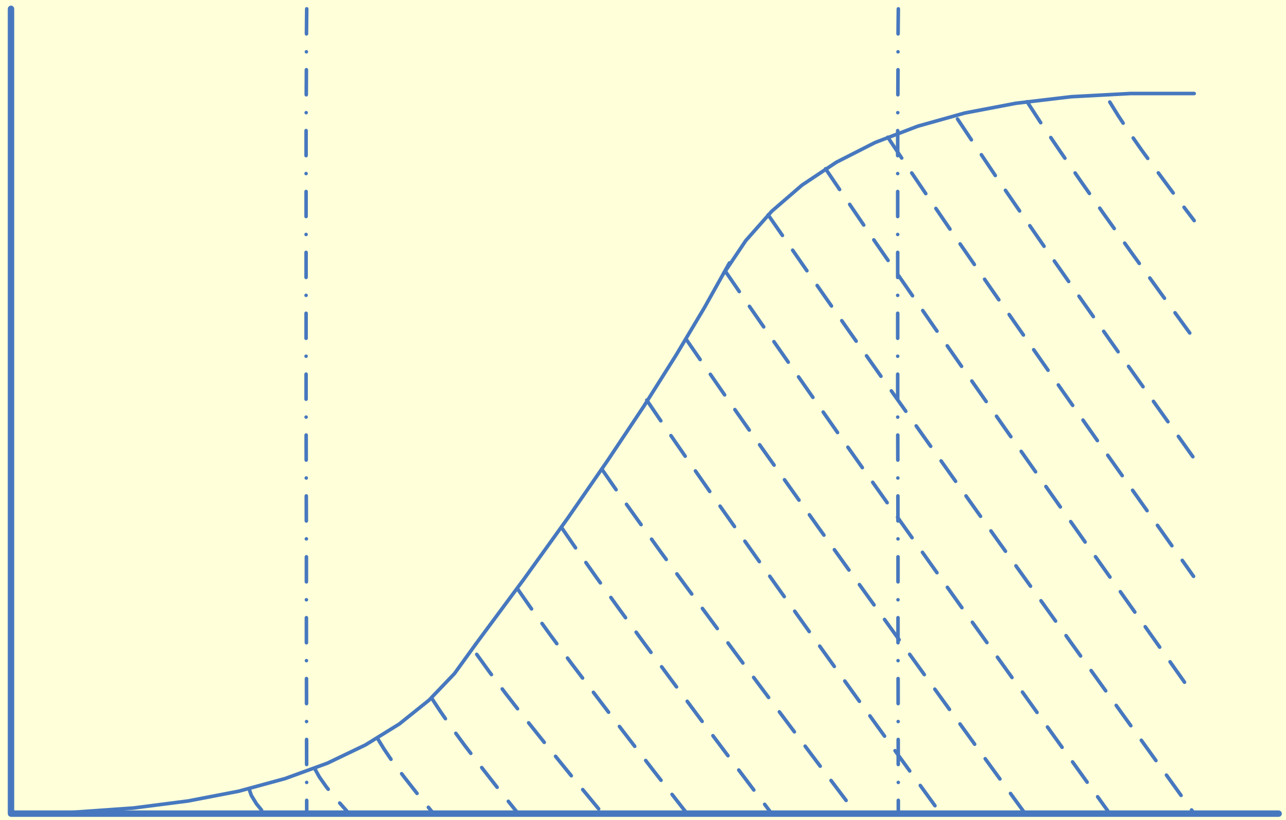
- During major construction works, utility capital tied up. Problem:
  - Uncompleted assets not in Regulatory Asset Base (hence no return)
  - PBR provides for reasonable return on efficient investments
  - Investors require return on capital – regardless of how applied in utility
- RDWR therefore allows for a return on this tied-up capital
- This takes the form of the CWIP-factor, which is added to the:
  - Value of the regulatory asset base
  - Capital expenditure allowance
- Therefore no further allowance for interest during construction !
- A detailed description of the ERC's approach adopted for the CWIP:

  "*Preliminary Calculation of the Construction Work in Progress Factor that will apply during the Second Regulatory Period* "

  August 23, 2006

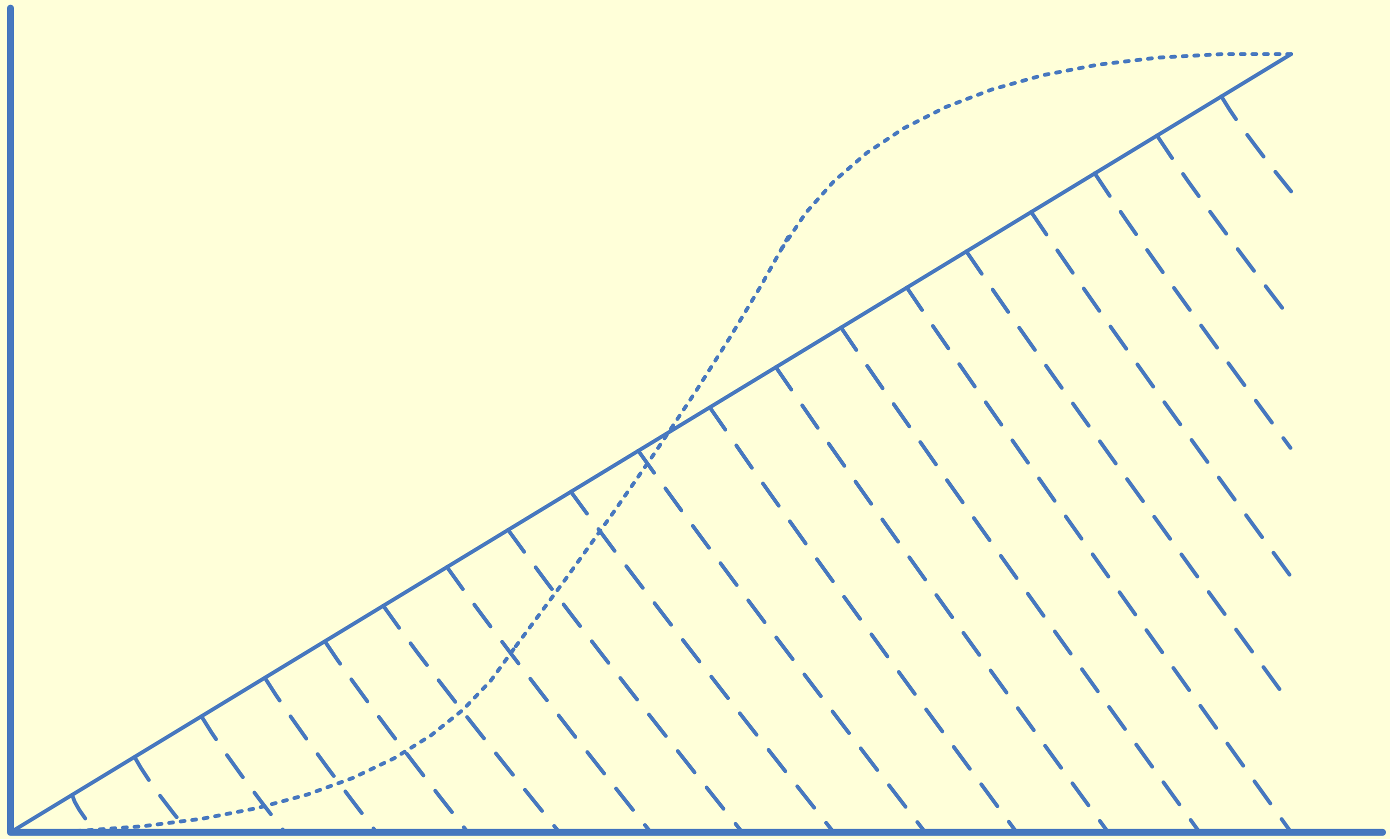
Construction work in progress

- The normal project cash-flow looks as follows (S-curve):
  - With the shaded area representing the capital tied up



Construction work in progress

- This is often simplified to a straight-line approximation
  - Appropriate where project duration is short to medium



Construction work in progress

- And the formulas for calculating the CWIP becomes:

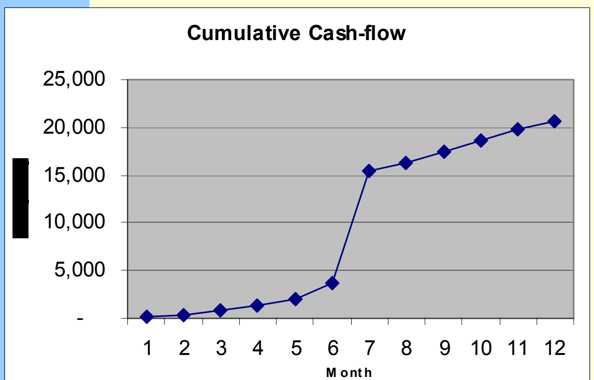
$$IDC = \sum_{p=1\,to\,n} \left\{ \frac{TC}{n} \left[(1+i)^{\frac{n-p}{12}} - 1 \right] \right\}$$

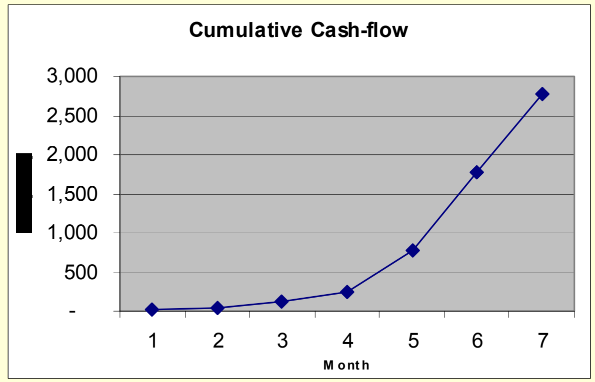
$$CWIP = \frac{IDC}{TC}$$

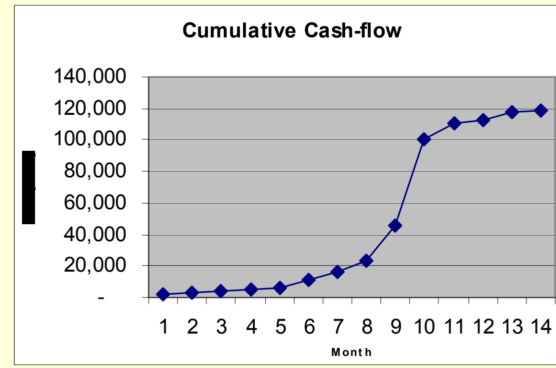
where	IDC	=	interest during construction;
	TC	=	total project cost;
	i	=	rate of return allowed; and
	n	=	project duration (months).

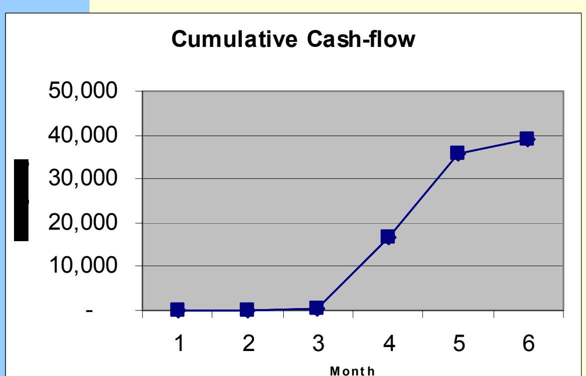
Construction work in progress

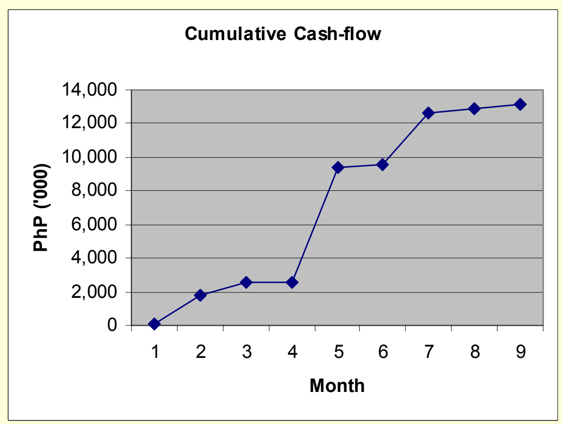
- ERC researched typical large and small construction projects

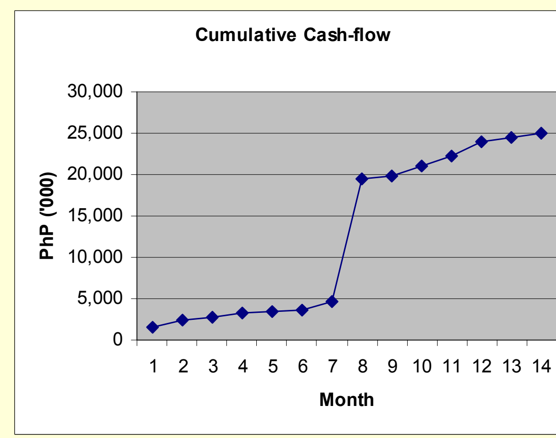












Construction work in progress

- Based on the research:
  - Adopt typical construction period of 8 months for substation projects
  - Adopt typical construction period of 6 months for all other projects

  - This recognizes large influence of the smaller projects

This translates to the following CWIP factors, using the regulatory WACC as the allowed return on capital tied up:

- 3.6% for substation projects
- 2.6% for other projects

Working capital factor

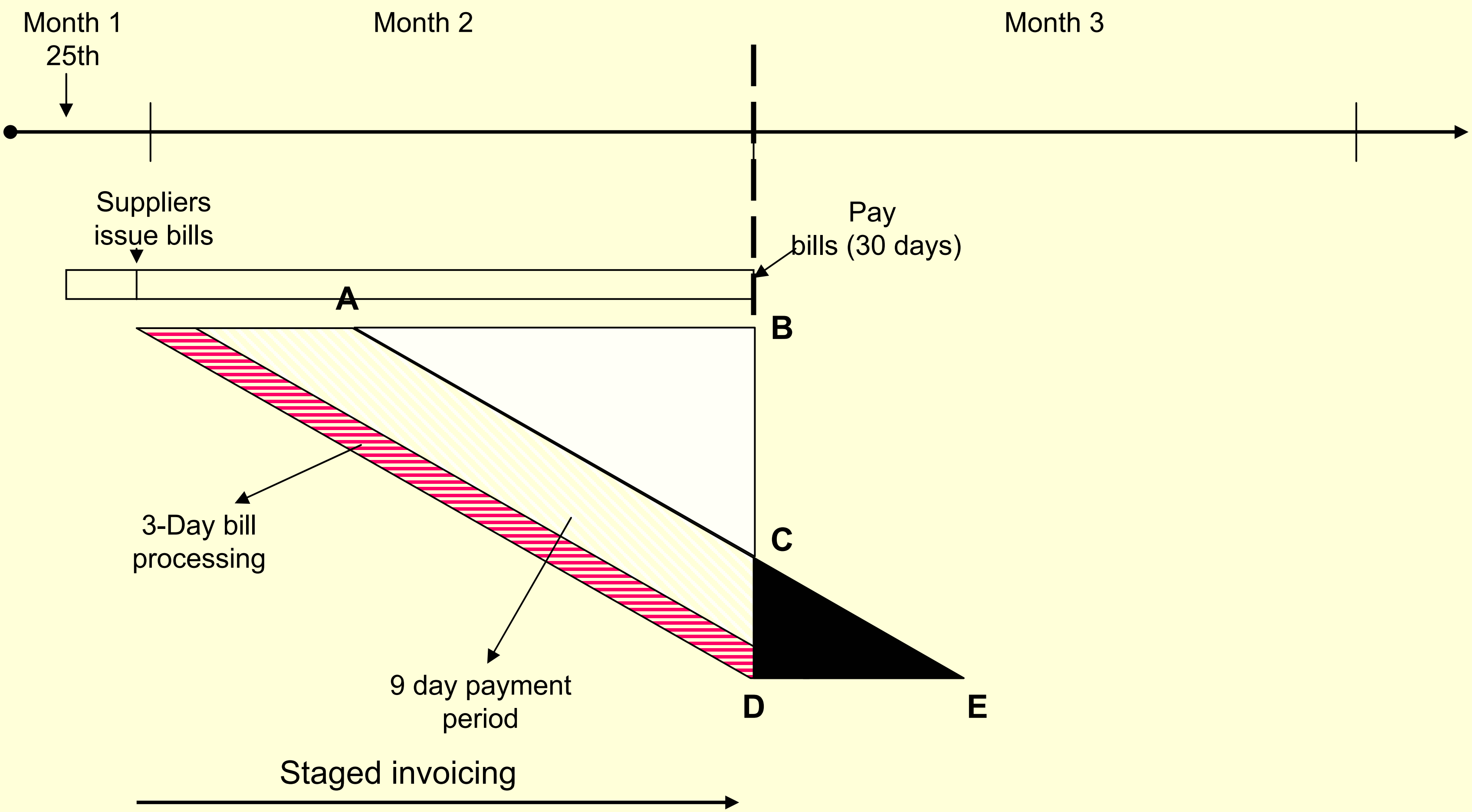
- RDWR provides for a return on working capital tied up in the distribution operations of a utility
- ERC also recognises that capital is tied up in energy purchases, which cannot be recovered elsewhere
  - Allows this to be recovered in distribution rates (until system changed)
- Working capital allowed as a percentage of Opex
  - Percentage base on lead/lag study of utility cash-flow
  - Allowing for a hypothetical, efficient company

Working capital factor

- Based on information received,
  - The working capital required for energy purchases dwarves that required for normal operations
  - However, based on the contractual settlement period for consumers ($\pm$10 days), and the settlement period offered by suppliers ($\pm$ 30 days):
    - There should be no working capital tied up
    - Negative net working capital ?
- ERC therefore decided to make zero allowance for working capital on energy purchases
- Allowance for working capital in distribution operations – 3% (for First Entry Group)

Working capital factor

- Even applies where invoicing to consumers is staged during month
  - – Triangle ABC (money received before payment due to suppliers) larger than CDE (money received after payment due)



Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- Return on capital building block allows return on RAB
- However:
  - Lag between the date at which the assets are valued and the start of the regulatory period
  - Additional assets acquired plus disposals over this period
  - Also new acquisitions & disposals during the regulatory period
- So, the value of the RAB changes constantly
- There need to establish the value of a rolled-forward RAB
- Value of the RAB used to calculate the building block is based on the average value of the rolled-forward RAB for each year
  - (Opening value + closing value)/2

Calculating the value of the rolled forward Regulatory Asset Base (RAB)

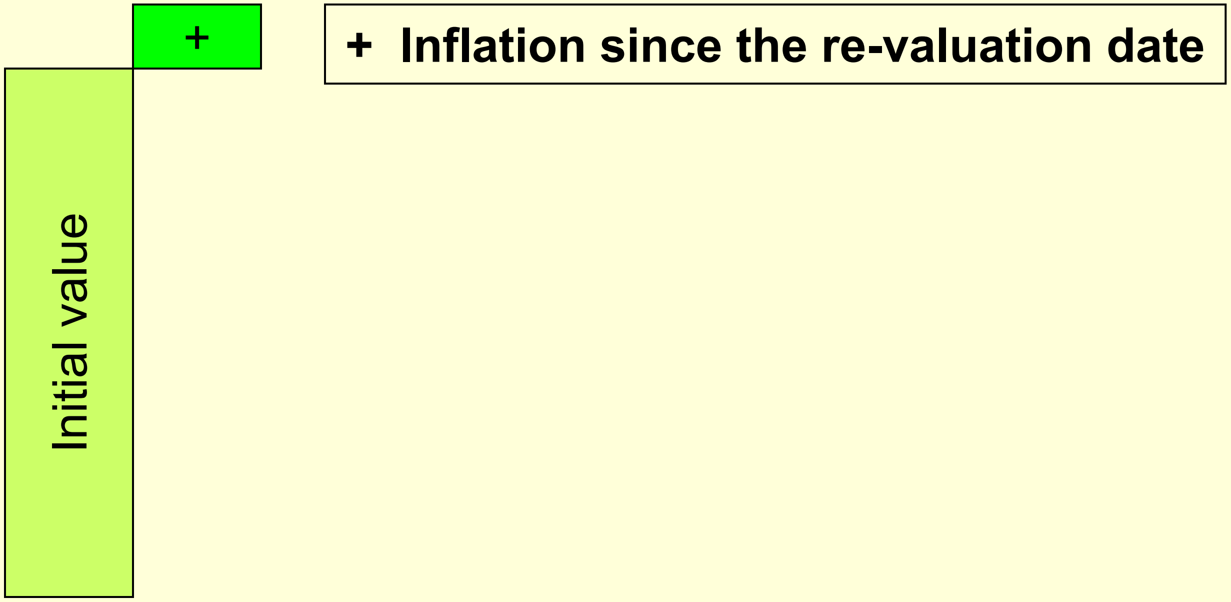
- To calculate the value of the RAB at the start of the Regulatory Period

Initial value

Value of the RAB at the initial re-valuation date

Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period



Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period

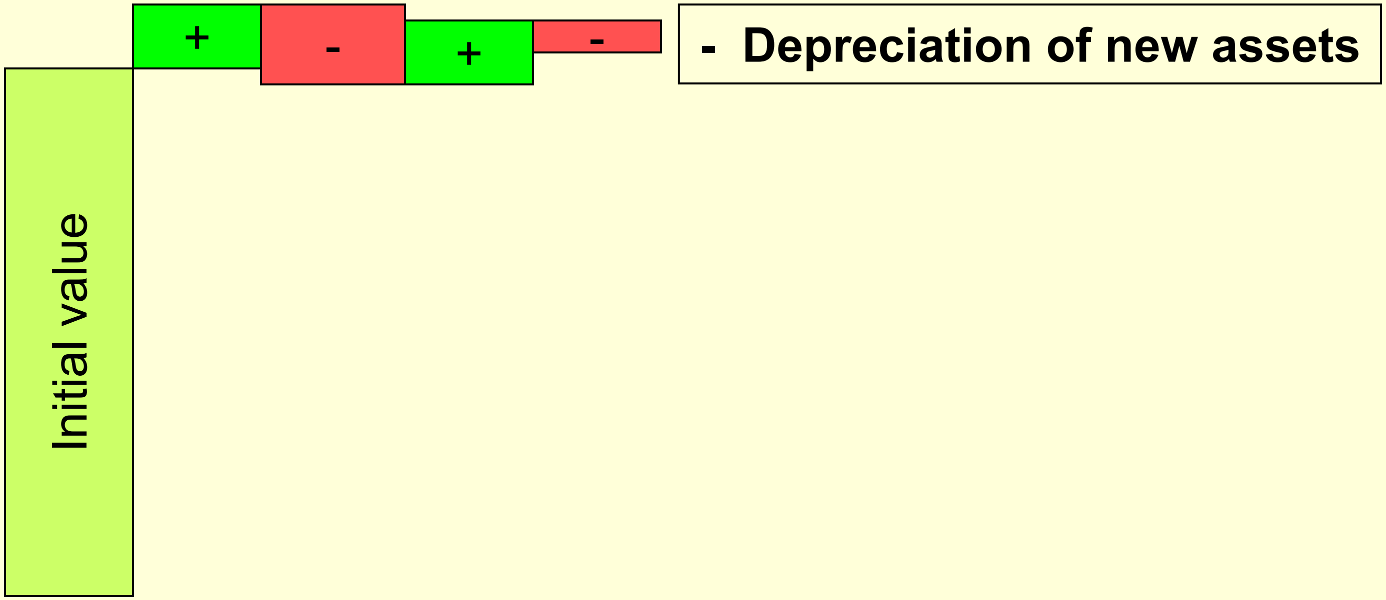
- Depreciation of the initial asset base

Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period

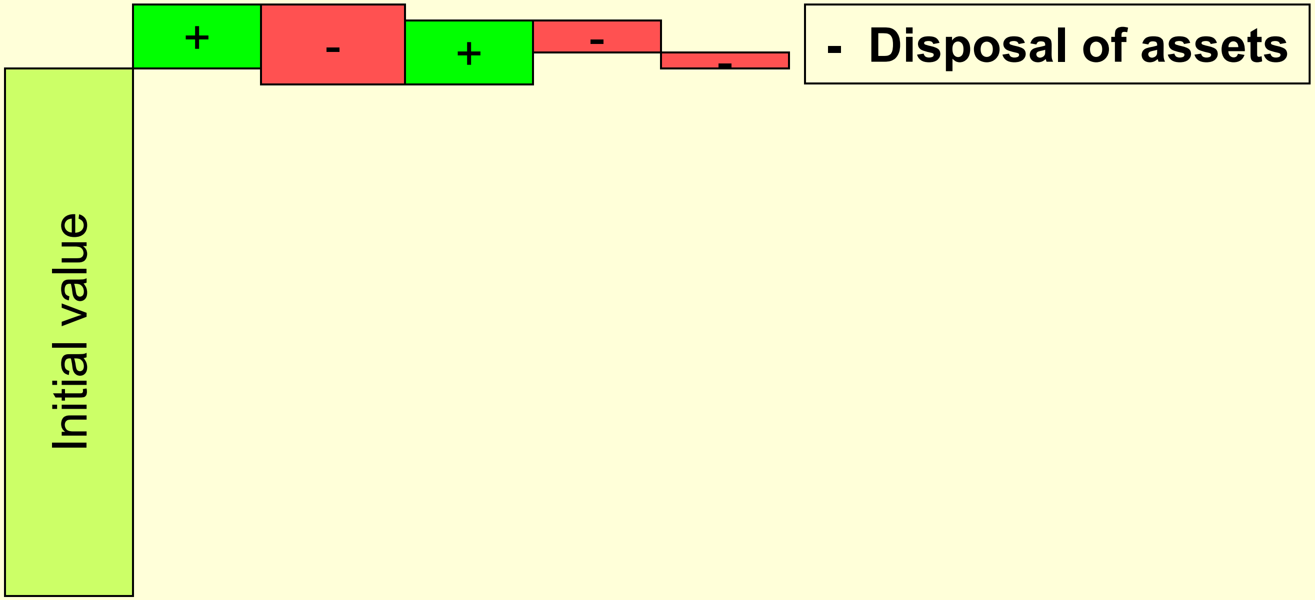
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB <u>at the start</u> of the Regulatory Period



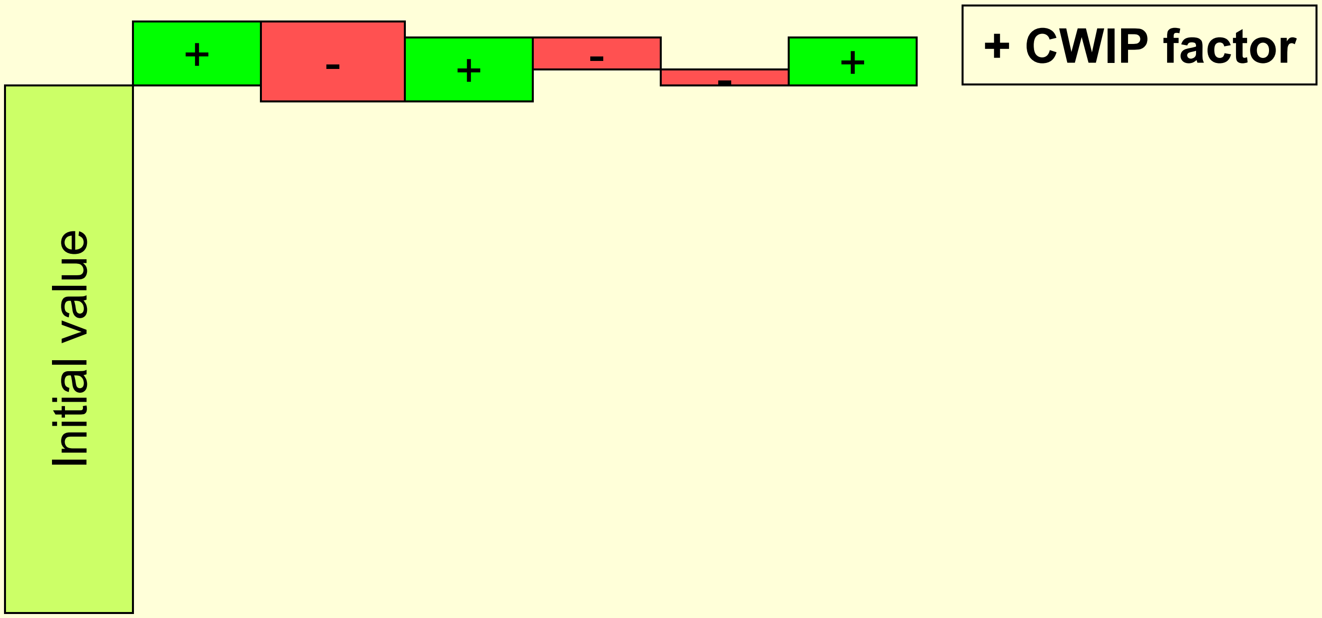
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period



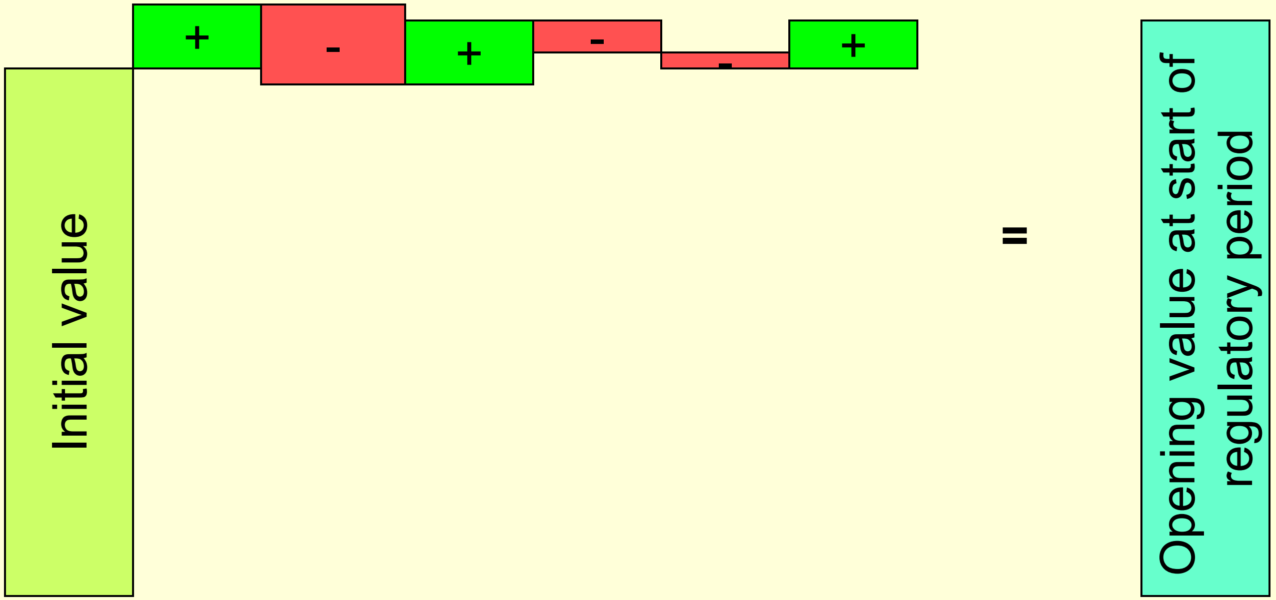
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period



Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the value of the RAB at the start of the Regulatory Period



Calculating the value of the rolled forward Regulatory Asset Base (RAB)

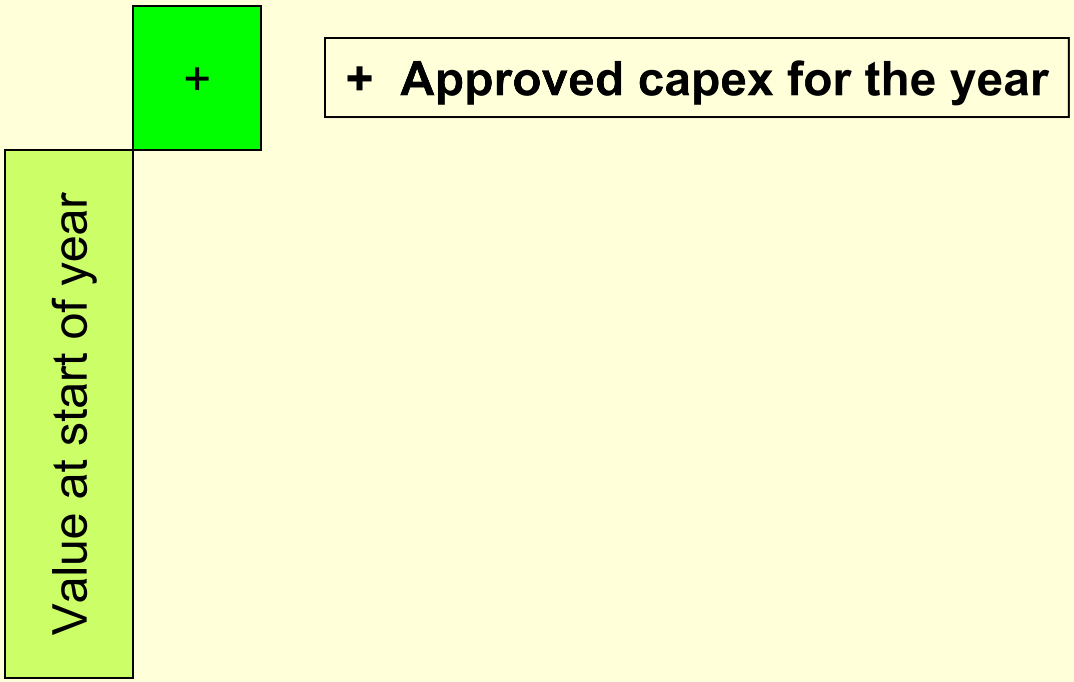
- To calculate the closing value of the RAB for each regulatory year during the regulatory period

Value at start of year

Value of the RAB at the start of a year

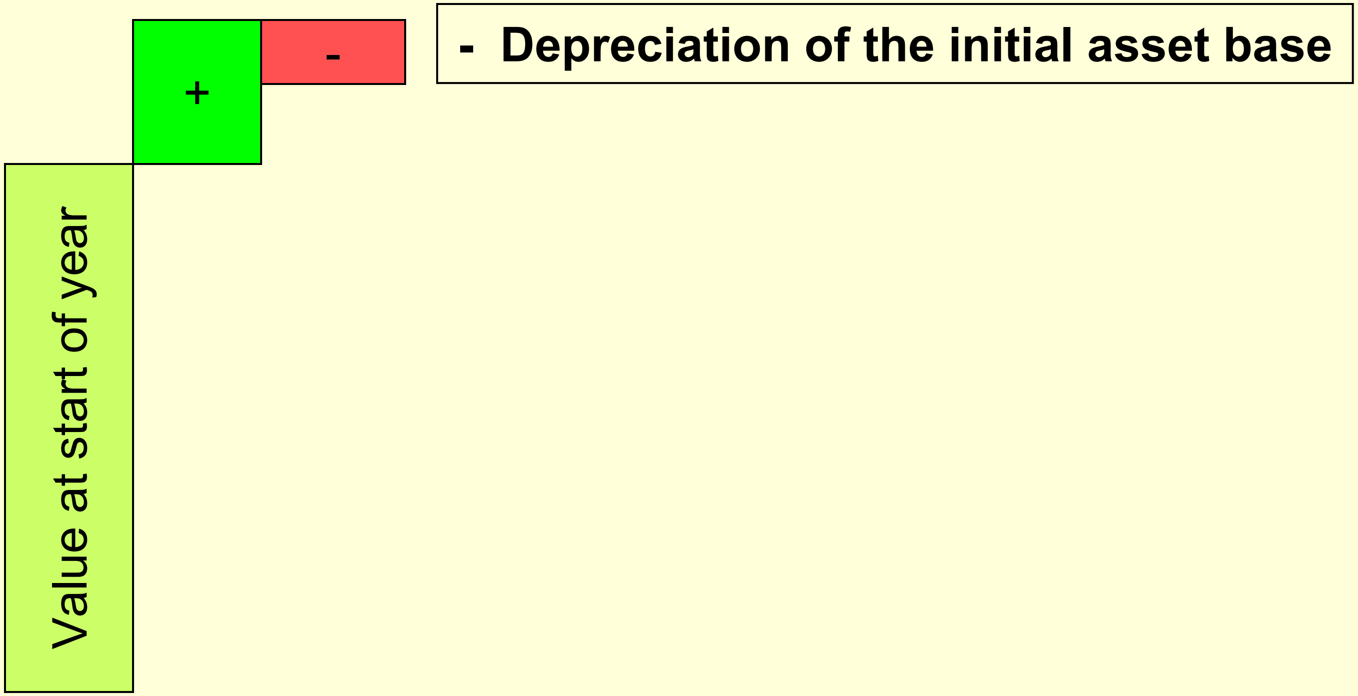
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the closing value of the RAB for each regulatory year during the regulatory period



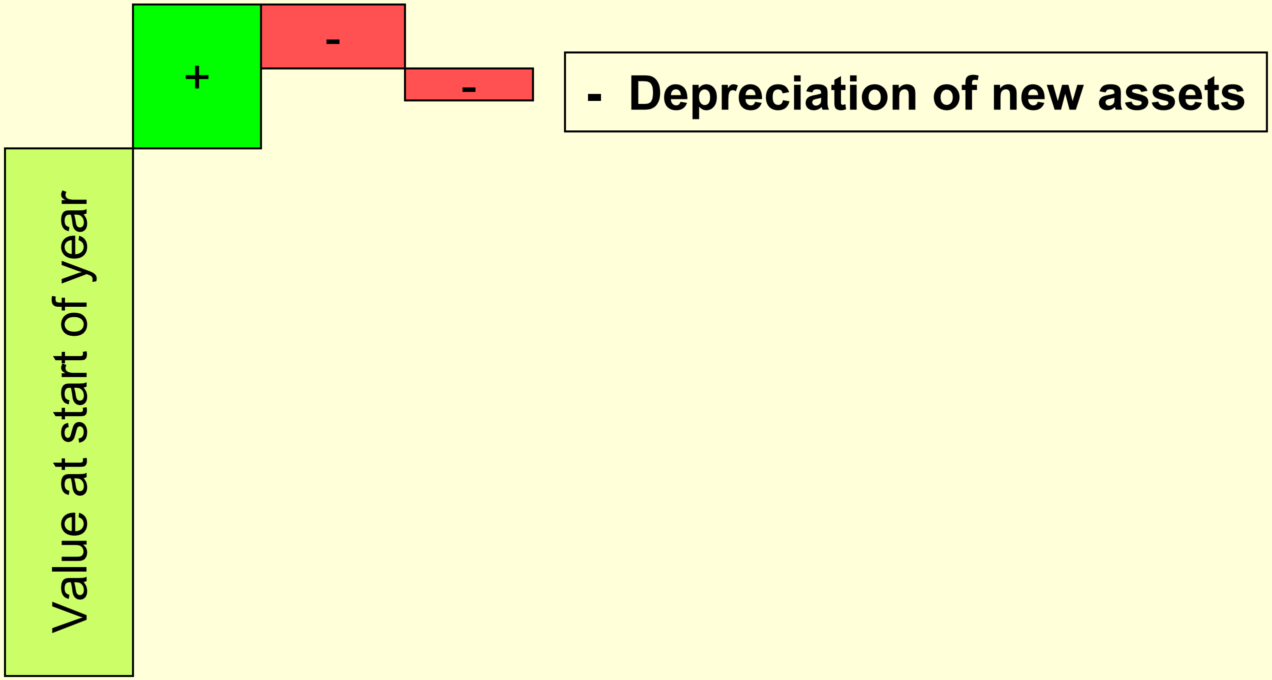
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the closing value of the RAB for each regulatory year <u>during</u> the regulatory period



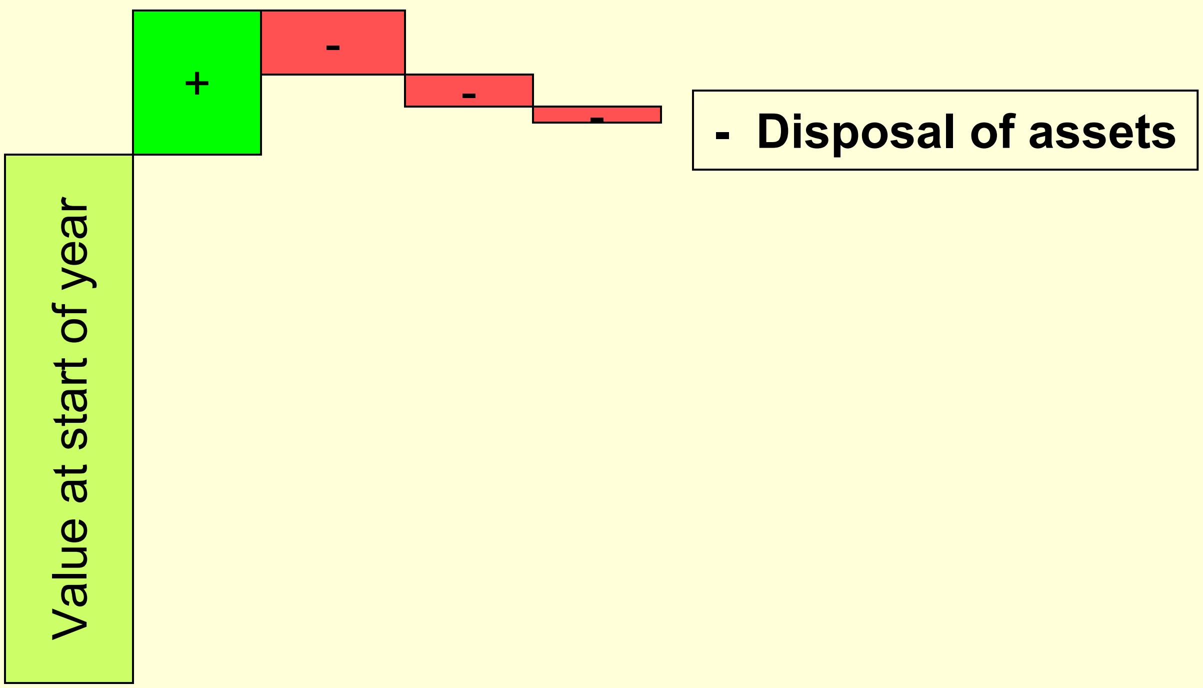
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the closing value of the RAB for each regulatory year during the regulatory period



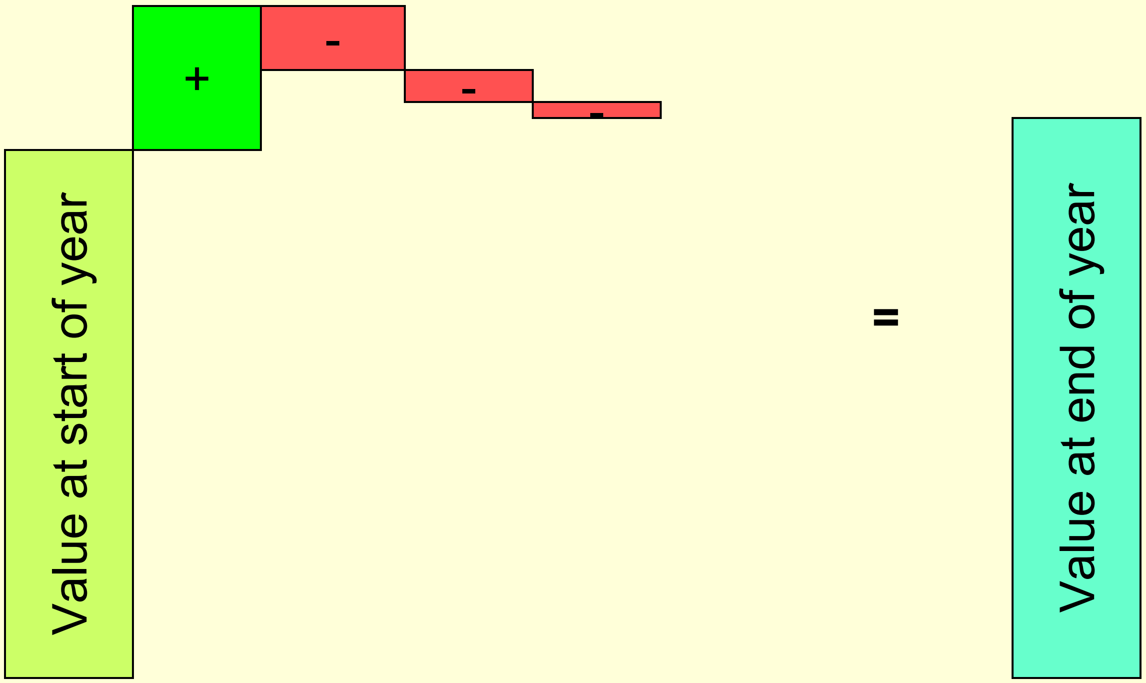
Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the closing value of the RAB for each regulatory year <u>during</u> the regulatory period



Calculating the value of the rolled forward Regulatory Asset Base (RAB)

- To calculate the closing value of the RAB for each regulatory year <u>during</u> the regulatory period



Economic Indices

- Economic forecasts required for price-cap calculation
  - Philippines consumer price index
  - USA consumer price index
  - PhP/US$ exchange rate
- Limited information is available on these forecasts for a 4-year period
- ERC has generally relied on the forecasts published by the Economist Intelligence Unit for the Philippines and the USA

Economic Indices

- The figures accepted for the First Entry Group

	2006	2007	2008	2009	2010	2011
Philippine CPI (% increase per regulatory year)	7.1%	4.6%	3.2%	3.4%	3.4%	3.5%
US CPI (% increase per regulatory year)	3.8%	2.9%	2.6%	2.7%	2.6%	2.5%
PhP/US$ exchange rate (average for regulatory year)	53.7	48.9	47.2	47.4	47.3	47.0

(Source : EIU, July 2007 – converted to regulatory years)

- Note that the ERC has adopted annual figures, adapted for regulatory years
- RDWR calls for quarterly figures in some instances
- However, no reliable quarterly forecast information available
- Will therefore consult on adapting the RDWR for annual values

DISCUSSION

Thank You

Proceed to next session

Regulatory WACC – Changing economic parameters