Response to Consultation Document: Comments on Retail Tariffs Design Regulatory Authority - Bermuda

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Distribution:

Jozelle Escolastica The Regulatory Authority Comments on Retail Tariffs Design **e-mail: electricity@RAB.bm**	Denton E. Williams M.I.E.T, M.I.E.E.E. Senior Vice President, Ascendant Group Chief Operating Officer, BELCO **e-mail:** [redacted]

Introduction

I have four main criticisms of this consultation document, they are:

1. Definitions of a number of important terms are yet to be added for instance; rate-base, reliability, efficiency.
2. This Consultation document is bereft of quantitative and qualitative data and bereft of quantitative risk analysis recommendations for an investor-owned electric utility.
3. Very few references are cited.
4. There are few recommendations for standard metrics used in the electric utility industry, such as safety.

For the reasons above, I have had to refer to the Consultation Document page and section numbers first in columns 2 & 3. Then in column 1, I reference answers 1 through 31, then, responses are given to most of the 31 questions toward the end of the document, and just before the Appendix.

Responses

Q.	Pg.	Sec / Table	Response
	4	#2(a)	The Revenue Requirements method with refinements common in the industry does encourage efficient investment in generation capacity, although the current regime may not encourage independent procurement of generation.
	4	#2(b)	Application of the Revenue Requirements Method, particularly the Minimum Revenue Requirements Method, does provide sufficient incentives by BELCO for least cost provision of electricity services for all classes of customers.
	5	#6	The RA needs to properly define the 'rate base' components in conjunction with BELCO in a form suitable for Bermuda and in general conformance with US or Caribbean investor-owned electric utilities comparable with BELCO. The RA has to be clear on whether the return say if 10.5% is recommended, that it is a Return on Equity, or a return on the WACC, which is the same as the Minimum Acceptable Return (MAR), which is the same as Return on Rate Base. Normally, but not always, it is the % return on Rate-base. 'Rate Base' which is the starting point for the Revenue Requirements method, is defined in #7 immediately below:
	5	#7	Instead of the explanation of 'Allowed revenue' under Item 7, the definition and diagrams in the Appendix are recommended as a clearer demonstration of Revenue Requirements, or alternatively alter the RA definition in Sections #7 and in #50 to: Allowed Revenue = Profit Incentive + Operating expenditure ("OPEX") + Depreciation of the Rate Base + Rate Base X (Return on Rate Base = WACC = MAR) + RA Licensee fees. I do not see a definition of rate base in the Consultation paper, so I have added two possibilities (1) and (2) below. Refer to #83 on page 27. Least Cost Electric Utility Planning by H.G. Stoll 1989, page 95 defined as: Rate base (1) = total plant in service - accumulated depreciation reserve + materials and supplies (optional) + fossil fuel inventory (optional) + working capital allowance (optional) - deferred income taxes (optional) – Not applicable in Bermuda - deferred investment tax credit (optional) -Not applicable in Bermuda

			+ construction work in progress = CWIP (optional) BL&P from their 2009 Application to the 'Barbados Fair Trading Commission', below: Rate Base (2) = (Cost of Plant - Depreciation) + CWIP + Current Assets and Liability. Adjustments
	5	#8	I see no justification in this paper or elsewhere for 'Incentive Regulation'. This can be accomplished simply by Revenue Requirements. Two types of regulation is a proposal to provide year-round employment for more than one of a Consultant's staff, and for the RA to incur extra expense and to unnecessarily complicate the regulatory process.
	6	Table 1.1	I see a 'non-mathematical' definition of rate base at the top of this table. See #7 above, for two mathematical definitions of rate base.
	16	#50	See item #7 for a revision of the definition of 'Allowed Revenue'.
	18	#54	Items (e) and (f) are best handled directly by BELCO and only need monitoring, not investigation by a consultant. I see no evidence in this paper that the Consultant, or the RA, have an in depth understanding of the terms quantitative reliability, quality of electric service, or economic efficiency. I do not see anywhere in this document, a definition of 'economic efficiency'. However, one definition of economic efficiency might be to continually minimize TD&R system losses on a 'monitored' yearly basis, producing a reduced revenue requirement.
	20	#57(a)	Rate–of-Return, regulation on rate base, not on the subset, ROE. Return on Rate base is most popular in North America, especially the USA. It is used in at least the following states to great effect (listed from A to I only): Alaska, Arizona, California, Colorado, Connecticut, Florida, Minnesota, Louisiana, Massachusetts, New York, Maryland, North Carolina, Maryland and Iowa. Add to these, Barbados Light & Power.
	20	#57(b)	Incentive regulation (either price or revenue caps, has not worked well anywhere and does not have the intent of the Revenue Requirements method of rate-of–return. Price-Cap regulation is a regulatory price-setting mechanism (two other forms of Performance Based Ratemaking are Sliding Scale and Revenue Cap), that may have superior theoretical properties relative to traditional prospective cost-of-service regulation, but the assumptions necessary for its superiority hold in few, if any, environments in electric utilities. There seems to be little credible evidence (in the UK and elsewhere), that it has worked well at reducing production inefficiencies, improved resource allocation and lowering regulated prices paid by consumers as prospective cost-of-service regulation. Ref.: Price-Cap Regulation and Its Use in Newly Privatized Industries Frank A. Wolak Department of Economics Stanford University.
	21	#59	Read the first sentence of this section that I agree with. The scheme recommended here is overly complicated and would be an unnecessary yearly expense for the RA for two types of regulation that are incompatible. Please see the Appendix for a simple Revenue Requirements Proposal incorporating the normal Profitability Incentive highlighted (in blue).
	21	#60	The idea has not worked well in other jurisdictions for investor –owned electric utilities, particularly in the UK. See the comments again in #57(b).
	22	#61	No. The recommendation in #61 for a hybrid form of regulation is totally unfounded and would be totally ineffective in Bermuda.

	22	#62	No. These comments are rubbish. Please refer again to item #57 (b) and please consult the reference cited.
	22	#63	It is agreed that there should be 5 year price control periods and use the pass-through of any CAPEX. See the comments in the RA paper #58(b).
	24	#70	Strong enough incentives depend on the quality of the regulation and on the use of a tried and proven Rate and subsequent Tariff system, preferably, Revenue Requirements.
	24	#71	Unnecessary complication.
	27	#83	Two possible definitions of Rate Base, depending on content are given in #7, on page 5.
	33	#110	The approach here should be to estimate the allowed 'range of', not a single point estimate ROE of a regulated investor-owned electric utility, which internally uses the Revenue Requirements Method and also as the company basis for application to a PUC (Regulatory Body) for a rate increase and hence customer class tariffs update.
	33	#111	Are different ROEs possible for a vertically integrated electric utility, as small as BELCO?
	33	#112	Consult any US state PUC or the National Association of Regulatory Utility Commissioners (NARUC) in the USA, for applicable 'WACC' approach and not the one proposed.
	34	#115	This approach is not applicable for Bermuda as also discussed elsewhere in this paper.
	34	#119	Regulators cannot choose the cost of debt as this is a function of a BELCO management decision concerning the level of equity verses debt, what debt financing the market will supply and a function of the revenue requirements of the company and finally the financial risk profile BELCO has and will establish.
	35	#120	The 'RA' needs to read carefully what they have written on the last line of #120.
	35	#122	The cost of debt should be based on BELCO's experience plus the experience of island utilities similar to BELCO in as many aspects as possible and on BELCO's commitment to investors and on BELCO's financial risk profile of debt to equity ratio .
	35	#124	The 'RA' needs to read carefully what they have written on the last line of paragraph.
	37	#130	Power system '*reliability*' and power system '*security*' are two separate concepts by which one attempts to measure the robustness of a power system against disturbances. *Power System Security* Assessment by contrast, is an operational problem, which will change with operational conditions. It depends not only on the reserve capacity available in a given situation, but also on the contingent probability of disturbances. Whereas, 'reliability can be given a precise mathematical definition in terms of probabilities, it is much more difficult to attach numerical indices to security. Often, one talks about electrical robustness of the system against one, or several power system contingencies. Power system *reliability* or *power system reliability analysis*, involves probabilistic indices exemplified by the loss-of-load probability (LOLP), or the loss-of-load expectation (LOLE), defined as the long-term average number of days (or number of hours) on which the daily load exceeds the available generating capacity. Determining the 'reliability' of a system thus is reduced to a mathematical problem of computing the probability of generated power to reach the load in a given power system. Reliability seldom changes with time and its achievement becomes a system planning problem. It is the most important factor that distinguishes probabilistic generation, transmission and distribution planning from deterministic planning methods. It allows for consistent comparison of expansion schemes in a system and between power systems. It uses Operations Research (OR) and probability combined with engineering economic analysis such as MRRD (Minimum Revenue Requirements Discipline). MRRD is a

			refinement of the Revenue Requirements Method where the revenue requirements are minimized. In this context, system probabilistic reliability considerations (in planning and in engineering), starts at the bulk customers' 4kV bus and works back to the prime mover (diesel / gas turbine), using criteria such as Loss-of-Load Probability (LOLP), but preferably, Loss-of-Load Expectation (LOLE) applied to imperfect generation, imperfect transmission and imperfect distribution at 4kV, using Forced Outage Rate (FOR) data, or the System Average Interruption Duration Index (SAIDI) at primary distribution level as adopted by LUCELEC and Barbados Light & Power in the Caribbean. Another source for information on LOLE and SAIDI applicable to Generation Reliability and Network Reliability would be the Canadian Electrical Association. For a S*afety Standard*, the RA need look no further than ISO 18001, adopted by BELCO years ago, not as far as registration, but utilizing the ISO guidelines only to reduce paperwork. Regarding *network efficiency*, this depends on the definition the RA is using for network efficiency. Finally, *Customer satisfaction* can be garnered from BELCO's own surveys and can be benchmarked against LUCELEC and Barbados Light & Power in the Caribbean.
	38	#132	Does the RA and its Consultant have any experience with IRPs? If yes, what education, training and experience?
	38	#133	Does the RA and its Consultant have any experience with PPAs in an island vertically integrated electric utility? If yes, what education, training and experience?
	38	#136	If new generation assets proposed by IPPs are such that they are significantly more expensive than BELCO, then bulk generation may have to be left exclusively to BELCO.
	38	#137	The same arguments for #135 apply here. Further, this is another example of how the 'RA' would be wasting hundreds of thousands of dollars on Consultants.
	39	#142	No, not as outlined in Section 6.5 and not using CAPM.
	40	#145	This is best done within the context of Minimum Revenue Requirements, which as mentioned before is system wide optimised (via Operations Research, engineering, engineering economics and highly computerised financial simulation). Revenue Requirements is widely practiced by many state Utility Commissions in the USA.
			Responses in order of the Questions in Consultation Document
1	54		No. It would be better to work with only one method of regulation, in this case, the rate-of-return on rate base is preferred. The approach by the RA would be improved if the emphasis was on Minimum Revenue Requirements and not just on Revenue Requirements. Refer to the Appendix.
2			No. The approach of Revenue-Cap has nothing to do with Revenue Requirements and even less with Minimum Revenue Requirements, as it steers the 'RA' in the wrong direction from the start and will cause the RA unnecessary expense. See further comments in Item #57(b) on the disadvantages of Incentive Regulation.
3			There are three reasons why the rate application regime should be on a three year or preferably five year cycles. Firstly, for a utility to raise capital in the market, lenders want to see a stable 'Regulatory Authority' Regime and simultaneously want to be sure to get their money back. Secondly, there is tremendous work and expense involved by BELCO in preparing a rate application. Lastly, the RA should use the next 3 but preferably 5 years, to learn how to better handle rate applications, build internal RA expertise, while saving expense on unnecessary rate applications assistance by overseas consultants, unless a rate revue is specifically requested by BELCO.
4			Agreed.
5			No. See #70 and #71.
6			Yes.

7			Yes.
8			Yes.
9			Agreed.
10			Yes, because that is what is in place, it works well, it is simple and more complicated methods are only required when various taxes are involved, as in the USA.
11			How will you challenge this unless you have the services of an Electrical Utility Engineering Economist and a Generation Planning Engineer familiar with an island Electric Utility comparable in size and profile to BELCO, and not using persons who have never worked in an electric utility for at least 10 years.
12			Yes.
13			No.
14			No, not the vanilla basis. Use the NARUC approach. See the comments in #122.
15			No. The reason is CAPM is not applicable for a regulated investor owned electric utility because it is not normally used in the US for the majority of electric utilities. The normal WACC approach can be found in any text on electric utilities.
16			No.
17			No
18			No response.
19			No, I do not agree. BELCO should be monitored, and left to do their job as outlined in 20 below. If the RA means incentivised using Incentive Regulation, again, No!
20			Power system '*reliability'* and power system '*security'* are two separate quantitative concepts by which one attempts to measure the robustness of a power system against disturbances. Power system *reliability* or *power system quantitative reliability analysis*, involves probabilistic indices exemplified by the loss-of-load probability (LOLP), or the loss-of-load expectation (LOLE), defined as the long-term average number of days (or number of hours) on which the daily load exceeds the available generating capacity. Determining the 'reliability' of a system thus is reduced to a mathematical problem of computing the probability of generated power to reach the load in a given power system. Reliability seldom changes with time and its achievement becomes a system planning problem. It is the most important factor that distinguishes probabilistic 'generation, transmission and distribution planning' from deterministic planning methods. It allows for consistent comparison of expansion schemes in a system and between power systems. It uses Operations Research (OR) and probability combined with engineering economic analysis such as MRRD (Minimum Revenue Requirements Discipline). MRRD is a refinement of the Revenue Requirements Method where the revenue requirements are minimized. Please refer to the Appendix. In this context, system probabilistic reliability considerations (in planning and in engineering), start at the bulk customers' 4kV bus and works back to the prime mover (diesel / gas turbine), using criteria such as Loss-of-Load Probability (LOLP), but preferably, Loss-of-Load Expectation (LOLE) applied to imperfect generation, imperfect transmission and imperfect distribution at 4kV, using Forced Outage Rate (FOR) data, or the System Average Interruption Duration Index (SAIDI), at primary distribution level, as adopted by LUCELEC and Barbados Light & Power in the Caribbean. Another source for information on 'LOLE and SAIDI' applicable to Generation Reliability and Network Reliability would be the Canadian Electrical Association. *For a Safety standard*, the RA need look no further than ISO 18 001 adopted by BELCO years ago, not as far as registration to the standard, but utilizing the ISO guidelines only to reduce paperwork, while conforming to the practices in the standard as much as practicable. Regarding *Network Efficiency*, this depends on the definition the RA is using for efficiency. Finally, *Customer Satisfaction* can be garnered from BELCO's own surveys and can be benchmarked against electric utilities LUCELEC and Barbados Light & Power in the Caribbean – two well managed utilities comparable with BELCO in size, generation mix and retail customer base.
21			Yes.

22			No. This is totally inappropriate for Bermuda. Refer to comments in #110 through to #124 of this response.
23			Yes.
24			If the scheme is similar to that described in #145, then yes, agreed.
25			The methodology as described in section 6.5 is not appropriate as described in my responses to #110 through to #124.
26			Yes,
27			Yes.
28			Yes.
29			Yes.
30			Yes, emphatically so. BELCO must be consulted and given preference as BELCO have the majority risk, not the 'RA and not the IPP. Refer to my response #58 (a) & (b).
31	56		None. Leave tariff allocation to BELCO, but monitor BELCOs' overall (optimised) Minimum Revenue Requirements approach from risk, fairness, effectiveness and 'EA' perspectives. See again the two diagrams on the last page of the Appendix which illustrate an optimized Plan A, as opposed to a simple non-optimized Plan B.

Appendix: Revenue Requirements Method (Minimum Revenue Requirements Discipline) of Electricity Price Regulation

In order to avoid the repetitious expression Minimum Revenue Requirements Discipline (MRRD), we ordinarily omit the adjective' Minimum' and refer to it simply as the 'smallest revenue requirement', or even more briefly as the Revenue Requirements Method. The better and more accurate name is Minimum Revenue Requirements Discipline applied either to Return on Equity (ROE), or Return on Rate Base (RORB) methods.

Minimum Revenue Requirements Discipline (MRRD), makes use of simple financial facts and principles that are not in dispute. MRRD uses strict definitions of economic terms. It is the method (until recently) of economic analysis preferred by many Public Service Commissioners (Electric Utility Regulatory Commissioners) in most states in the US. Reference the National Association of Regulatory Utility Commissioners (NARUC). MRRD recognizes that there can be differences of opinion with respect to estimated quantities, but no room for differences in opinion as to exact intent, particularly when calculating the minimum revenue requirement (using either ROE or RORB).

In the accompanying 'Diagram of Intent', over page[1], two projects are compared. The Corporate Planning Model (preferably using Probabilistic Reliability or Risk Tradeoff Techniques) would be combined with engineering economic data plus operating and maintenance costs via optimization of linear and non-linear models, using a mathematical multi-objective function and a mathematical set of constraints to minimize revenue requirements (for both project proposals) incorporating:

1. A balance of cost and reliability to all customers;
2. A profit incentive to the electric utility Minimal Acceptable Return (MAR) to pre-project investors;
3. A minimal cost of service to all classes of customers;
4. Conformance quantitatively to environmental legislation (clean air etc.,);
5. An opportunity to incorporate renewable generation (utility and non-utility) ownership;
6. Inclusion of the opportunity to incorporate CHP and Co-generations schemes.

Financial computer simulations (via corporate model programs) start after the engineering economic studies are completed and after the project economic choice is identified. Financial simulations produce proforma tariffs, proforma annual reports and proforma earnings per share. This by taking OGP results, simulating them with financing, expenses, revenues, regulation and accounting, (all as a minimum number of FSP inputs).

The Barbados Light and Power application for a review of electricity rates (in 2009), *see ref.:* *www.ftc.gov.bb/...**app/2009**-05-08_volume_1_section_2_**app*** Schedule 'C' and Schedule 'G' pages 0191 and 0193. Their method of Revenue Requirements uses the year-by-year (Test year) method of Revenue Requirements (Minimum Revenue Requirements Discipline). See reference 1 below. Four other variations to the type of Revenue Requirements Method are[2]:

- Book Life analysis (Reference 2 below);
- Continuing Plant (References 1 & 2 below);
- Short Term analysis Reference 2 below);
- Break-Even analysis (Reference 2 below).

[1] Jeynes P. H. Profitability and Economic Choice.1968 First Edition. The Iowa State University Press, Iowa.

[2] Matthews J; Broadwater R; Long L. The Application of Interval Mathematics to Utility Economic Analysis. TPS Vol. 5 No. 1 February 1990 pp 177 – 181. The IEEE.

The Revenue Requirements Method decides on a Minimum Acceptable Return (MAR), then on the assumption of a fixed income (normally predicable for electric utilities), calculates the required revenues. The Discounted Cash Flow Method (DCFM) often associated with the appraisal of opportunity, first estimates revenues, then calculates the return. In DCF, if the return is sufficient the investment is made, if not, there may be no investment at all. This situation usually does not occur in electric utilities.

The Net Present Worth method requires the calculation of positive and negative cash flows, as in the DCFR method, but instead of solving for the DCFR, a desired rate of return is used to calculate the present worth of all cash flows. The alternate with the largest net present worth is the economic choice for the project.

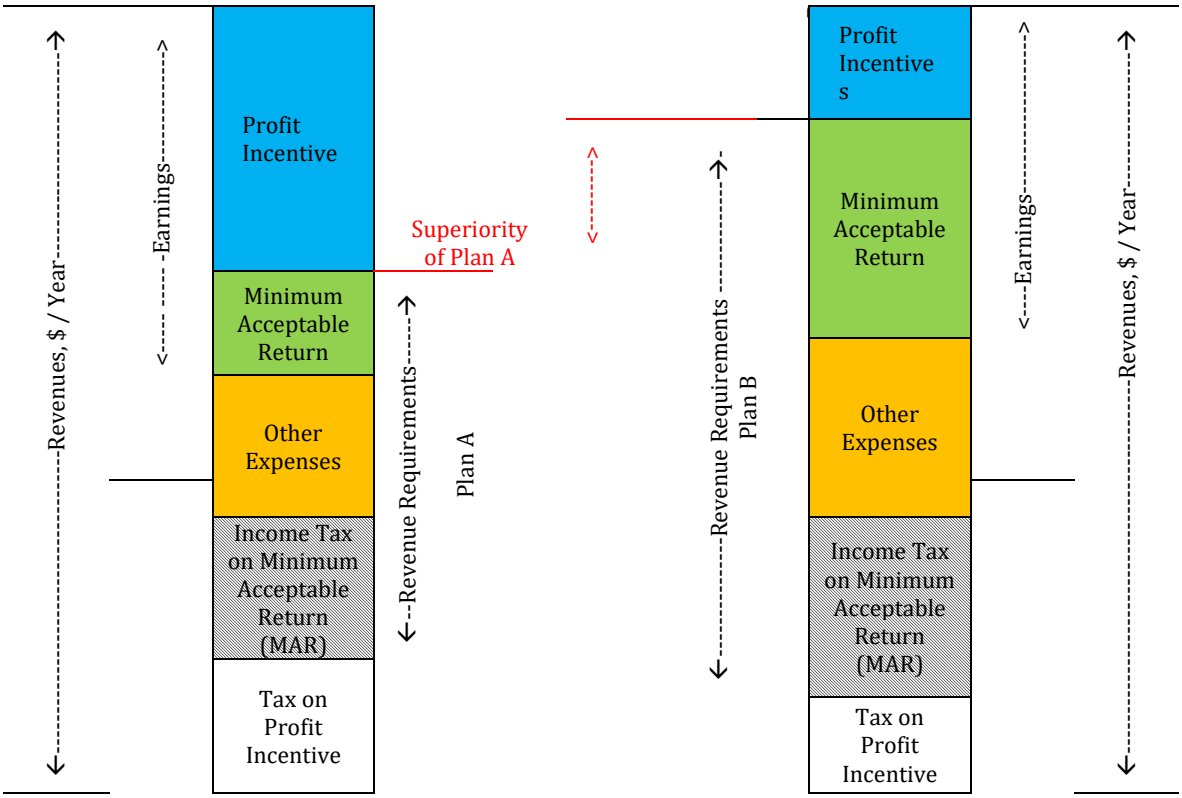
The Price-Cap approach as referenced in the introduction to this paper, may have superior theoretical properties relative to traditional prospective cost-of-service regulation, but the assumptions necessary for its superiority hold in few, if any, environments, including the practice by the UK electricity government regulator 'OFFER', now 'Ofgem'. The price-cap or RPI – X regulatory scheme sets the maximum rate of increase for regulated prices equal to the rate of increase in the retail prices index (RPI) less an X-factor

While the Revenue Requirements Method uses the present worth in its last step, i.e., compares the present worth of the 'Minimum Revenue Requirements for each planning option, the characteristic aspect of the MRRD method is the fixed charge rate (rate-base), which provides the bridge between a capital investment and annual operating costs. The other key aspect of the Revenue Requirements method is the particular 'revenue requirements' analysis used of which there are five in common use. See Matthews, Broadwater and Long.

The choice among the four methods of Revenue Requirements, or DCFM, Price-Cap, or other, may be based on, availability of data, practice, ease of calculation and economic validity. The Revenue Requirements Method requires serious expertise in Linear Systems, in Operations Research, in Power System Reliability Evaluation and in Engineering Economics, since understanding of optimisation, and simulation of linear and non-linear, objectives and mathematical constraints, is involved. However, the preparation involved, the results produced and the strong case that it generates would be hard for a Regulatory Commission to fault, or a Judicial Review to fault the data and results. This is because once the basic data is vetted; the mathematical models are produced and run the course through the Generation (Optimisation) Planning Program, then through the Corporate Financial (Simulation) Program, using Competent 'Systems' Engineers, thus, optimal results are produced in terms of:

1. Conformance to Environmental Constraints;
2. Optimal generation and customer quantitative reliability;
3. Optimimal minimal cost to all classes of customers;
4. Minimal Acceptable Return (MAR) to pre-project utility investors;
5. Opportunity investment (if possible) for renewables, CHP and Non-utility Co-generation;
6. Profit Incentive in addition to MAR for the Utility Investors.

It is difficult for the DCF, Net Present Worth and Price–Cap Methods to achieve the above bulleted points as well as the Minimum Revenue Requirement Method can.



<u>The Diagram of Intent</u> in economic comparisons (for all industry, regulated or not). This diagram is from Jeynes, page 66. [3]

Our purpose is to perform an economic comparison via engineering economics, computerised optimization planning followed by computerized financial simulations to select the alternative providing the greater <u>profit Incentive</u> out of <u>the same revenues</u>, on the reasonable assumption that the revenues for an electric utility are relatively fixed each year. Here above, <u>Plan A is superior (that is, the economic choice)</u>. We make allowance in above diagrams that Bermuda has <u>no tax on profit incentive</u> and <u>no income tax</u>. Let us see how Plan A is superior.

Our purpose is to select the plan that will accomplish two objectives simultaneously:

1. Earn the greatest Profit Incentive, in dollars, out of the same revenues;
2. Permit largest reduction in price of product (cost to all customers) with greatest Profit Incentive.

In the above Plan A, the reduction in price comes about largely by reducing 'other expenses' (mustard coloured box) and MAR (green). Other expenses are operating, maintenance and <u>depreciation</u>. Each diagram shows the same revenues ($/Y). However, the diagram on the left (Plan A), not only shows smaller MAR (green), but a larger Profit Incentive. MAR is an expense and the lower the MAR, the healthier the company. Further, revenue requirements in Plan A <u>are lower</u> for the same revenues in Plan B.

[3] Jeynes P. H. Profitability and Economic Choice. 1968 First Edition. The Iowa State University Press, Iowa.