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UKRAINE LOCAL ELECTRIC COMPANIES DRAFT INVESTMENT PLANNING PROGRAM (TASK C 4)

NIS Institutional Based Services Under the Energy Efficiency and Market Reform Project
Contract No CCN-Q-00-93-00152-00

Ukraine Power Sector Reform
Delivery Order No 18

Final Report

Prepared for

U S Agency for International Development
Bureau for Europe and NIS
Office of Environment, Energy and Urban Development
Energy and Infrastructure Division

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A

TABLE OF CONTENTS

Executive Summary		Page
S 1	Task Description	S-1
S 2	Methodology and Approach	S-1
S 3	Summary of Results	S-2
Appendix 1	Financial Analysis of Capital Investments	
	Attachment A	When to use Present Value Assessment
	Attachment B	The Present Value Assessment Process
	Attachment C	The Spreadsheet Printout
	Attachment D	Data Collection Sheets

B

EXECUTIVE SUMMARY

S 1 Task Description

The work on this task was initiated under Delivery Order 18 of the Ukrainian Power Sector Reform Project The Scope of Work for these activities included the specific Local Electricity Companies (LECs) – Task III C4 which states

> Provide LECs with a program of investment planning and other actions aiming to attract domestic and foreign investment capital

S.2 Methodology and Approach

S 2 1 In support of the privatisation process of the Oblenergos in Ukraine USAID set the task of providing the oblenergo management and accounting staff with a program for the analysis of financial investments

S 2 2 As the concept of analysis of the results of investment over time seemed to be a new concept to the oblenergos, effort was concentrated on explaining and demonstrating methods of analysis

S 2 3 A working Microsoft Excel spreadsheet was developed to actively demonstrate the process of analysis by taking examples and automating the calculations This gave two main benefits

a The automated spreadsheet could be used to illustrate the effects of changes in investment strategy and conditions

b The spreadsheet could also be left with the oblenergo staff with instructions so that they could apply the method to real examples within their company

S 2 4 Microsoft Excel was used to develop the demonstration spreadsheets because this is the software application in universal use by all oblenergos in Ukraine

S 2 5 Two oblenergos were involved in this task

L'vivoblenergo

Khmelnitskyoblenergo

S 2 6 The method of analysis and the demonstration spreadsheets were explained to the General Director, Chief Economist and Head of Financial Planning in each company

S.3 Summary of Results

S 3 1 At both oblenergos staff displayed strong interest in the process as a useful management tool for their present needs It was obvious from the discussions and questions put to the consultant that the concept had been well understood

S 3 2 The oblenergos at both locations were intending to use the method to assess real and current examples of the financial effects of investment or change

S 3 3 They were given electronic copies of the working spreadsheet together with written instructions as shown in Appendix 1

S 3 4 The consultant will maintain contact and advise on the examples being analysed by the oblenergo staff during the remainder of the contract

APPENDIX A
FINANCIAL ANALYSIS OF CAPITAL INVESTMENT

E

UKRAINE POWER SECTOR REFORM

UNITED STATES AGENCY
FOR
INTERNATIONAL DEVELOPMENT

FINANCIAL ANALYSIS
OF
CAPITAL INVESTMENTS

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F

FINANCIAL ANALYSIS OF CAPITAL INVESTMENTS

CONTENTS

1.	OBJECTIVE	1
2.	CONDITIONS	1
3.	GENERAL	1
4.	THE SPREADSHEET	2
5.	CAPITAL INVESTMENT COSTS	2
6.	TIMING OF PHASES OF THE PROJECT	2
7.	DISCOUNTING	3
8.	IMPROVEMENT IN LOSSES	4
9.	TIME-SPAN OF ANALYSIS	4
10.	DATA COLLECTION SHEETS	4
11.	EXAMPLE – COMPARISON OF OPTIONS	5
12.	FURTHER CONSIDERATIONS	7
13.	GENERALISED METHOD OF COMPARISON	8
14.	NON-QUANTIFIABLE BENEFITS	8
15.	RESIDUAL VALUES	8
16.	DISCOUNTED CASH FLOW	9
17.	INFLATION	10
18.	SENSITIVITY ANALYSIS	10
19.	RISK FACTOR	10

ATTACHMENTS

A. WHEN TO USE PRESENT VALUE ASSESSMENT
B. THE PRESENT VALUE ASSESSMENT PROCESS
C. THE SPREADSHEET PRINTOUT
D. DATA COOLECTION SHEETS

FINANCIAL ANALYSIS OF CAPITAL INVESTMENTS

1. OBJECTIVE

To provide the company with a method with which to analyse the financial effects of capital investments and any other changes that result in a future stream of financial benefits or losses over a period of years

2 CONDITIONS

The method used is most beneficial where there is a need to compare streams of financial effects, both positive and negative, which occur irregularly over a period of years Attachment A sets out a flow chart to assist in the decision about whether the conditions are right for the method to be worthwhile

3. GENERAL

To make a balanced Economic Analysis the following must be established -

Capital Investment Costs

Timing of Phases of the Project

Financially Quantifiable benefits, for example -

Improved Profitability

Improved Cost Efficiency

Reduction in the Cost of Losses

Improvement in Security

Reduction in Maintenance Costs

Attachment B is a flow chart to guide staff through the process

4 THE SPREADSHEET

Attached to this method is an active Microsoft Excel spreadsheet which is supplied with the data from the examples in this method It can also be used to form the basis of any Present Value analysis The instructions on its use are included in Attachment C which is a complete printout of the calculation sheets used for the examples given in this method

5. CAPITAL INVESTMENT COSTS.

Typical Costs to be included in the analysis

Gross Costs of New Works (i e including the overhead costs of administration and support services)

Scrap Value of equipment being removed minus cost of dismantling

All costs/savings should be based on current prices, since the use of a net discount rate takes account of inflation

6. TIMING OF PHASES OF THE DEVELOPMENT

Frequently one has the option of installing plant now or deferring the installation to some time in the future The timing of the installation also influences the cost of losses, the cost of maintenance and the continuity record of the installation over the lifetime of the development Frequently there are a number of options available as to how to proceed with the development In order to decide on the optimum option one should be able to compare the cost of the different components which make up each option Comparison of the Timing costs is possible by means of the 'Present Value' method

This operates as follows -

6 1 All options must be judged both on an economic and a technical basis In evaluating the costs/savings involved in each option, the time at which these will be incurred/accrued is relevant

6 2 The value of money spent or saved at present is greater than that of the same amount spent or saved at some time in the future

6 3 Money spent now will either have to be borrowed or diverted from funds to be invested

6 4 To compare different investment options economically all costs/savings are evaluated in terms of the current value of money

6 5 All future costs/savings are converted to present value by discounting

7. DISCOUNTING

The Present Value (PV) of $1 in N years from now is given by the following equation

$$\text{PV of } \$1 = \frac{\$1}{(1+ d/100)^N} \qquad (1)$$

Where d is the net discount rate The net discount rate allows for any inflation in costs in the future Future cost estimates should, therefore, not be inflated

Net Discount Rate should be advised by the LECs' accounting information function

Discount Rates should be revised from time to time

The present value of $ for net discount rates varying from 5% to 10% in 1 to 15 years time are given in Table 1 below If factors for different discount rates or at a time further in the future are required they can be calculated using formula (1) above

TABLE 1 PRESENT VALUE OF $1 IN 1 TO 15 Years

	Net Discount Rate					
Years Ahead	**5%**	**6%**	**7%**	**8%**	**9%**	**10%**
1	0 952	0 943	0 935	0 926	0 917	0 909
2	0 907	0 890	0 873	0 857	0 842	0 826
3	0 864	0 840	0 816	0 794	0 772	0 751
4	0 823	0 792	0 763	0 735	0 708	0 683
5	0 784	0 747	0 713	0 681	0 650	0 621
6	0 746	0 705	0 666	0 630	0 596	0 565
7	0 711	0 665	0 623	0 584	0 547	0 513
8	0 677	0 627	0 582	0 540	0 502	0 467
9	0 645	0 592	0 544	0 500	0 460	0 424
10	0 614	0 558	0 508	0 463	0 422	0 386
11	0 585	0 527	0 475	0 429	0 388	0 351
12	0 557	0 497	0 444	0 397	0 356	0 319
13	0 530	0 469	0 415	0 368	0 326	0 290
14	0 505	0 442	0 388	0 341	0 299	0 263
15	0 481	0 417	0 362	0 315	0 275	0 239

(This Table is also included in the active spreadsheet)

8. IMPROVEMENT IN LOSSES.

Due to a clause in the current LV Network Operators Licence formulation loss costs are passed on directly to the customer so at present there is no benefit or incentive to the LECs to reduce Losses However this clause may change Table 2 below gives the present value of constant losses over periods of 2 to 15 years duration It can also be used to analyse any costs (or profits) which are constant each year for a number of years

TABLE 2 PRESENT VALUE OF CONSTANT ANNUAL LOSSES OF $1 INCURRED OVER PERIODS OF 2 TO 15 YEARS DURATION

	Net Discount Rate					
Years Ahead	**5%**	**6%**	**7%**	**8%**	**9%**	**10%**
2	1 86	1 83	1 81	1 78	1 76	1 74
3	2 72	2 67	2 62	2 58	2 53	2 49
4	3 55	3 47	3 39	3 31	3 24	3 17
5	4 33	4 21	4 10	3 99	3 89	3 79
6	5 08	4 92	4 77	4 62	4 49	4 36
7	5 79	5 58	5 39	5 21	5 03	4 87
8	6 46	6 21	5 97	5 75	5 53	5 33
9	7 11	6 80	6 52	6 25	6 00	5 76
10	7 72	7 36	7 02	6 71	6 42	6 14
11	8 31	7 89	7 50	7 14	6 81	6 50
12	8 86	8 38	7 94	7 54	7 16	6 81
13	9 39	8 85	8 36	7 90	7 49	7 10
14	9 90	9 30	8 75	8 24	7 79	7 37
15	10 38	9 71	9 11	8 56	8 06	7 61

(This Table is also included in the active spreadsheet)

9. TIME-SPAN OF THE ANALYSIS.

The time-span should extend to the point when the options have attained equivalent stages of development This does not always happen and in such cases a time span of not more than 10 years should be taken, and residual values used

10. DATA COLLECTION SHEETS

Included as Attachment D is the data collection form which is used when initially considering options for analysis

11 EXAMPLE - COMPARISON OF OPTIONS

Two 35kV stations,

A - 2 x 2MVA
and B - 1 x 5MVA

feed a town and the surrounding countryside Load projections show that in two years time additional transformer capacity is required to meet the network operator's license conditions Discount rate 7 0%

The available options with capital costs are set out in Table 3

TABLE 3 - THE OPTIONS AND CAPITAL COSTS

OPTION		YEAR	CAPITAL COSTS
1	Uprate A to 2x5 MVA	2	$198,000
	Uprate B to 2x5 MVA	9	$135,000
2	Uprate B to 2x5 MVA	2	$135,000
	Uprate A to 2x5 MVA	8	$198,000
3	New 1x5 MVA basic type station at C	2	$324,000
	Uprate A to 2x5 MVA	8	$198,000

The time span is terminated at year 9 because in that year the three options attain the same total transformer capacity

OPTIONS

The relevant costs are set out in the following tables
(10kV urban and rural network losses and the net change in 35kV line losses are included)

TABLE 4 - OPTION 1

Year	Actual Cost of Losses $1 000's	Present Value Factor From Table 1	Present Value of Losses $1,000's	Present Value of Capital $1,000's	Present Value Totals $1,000's
1	28	0 935	26 18	0	26 18
2	28	0 873	24 44	198	222 44
3	28	0 816	22 85	0	22 85
4	28	0 763	21 36	0	21 36
5	28	0 713	19 96	0	19 96
6	28	0 666	18 65	0	18 65
7	28	0 623	17 44	0	17 44
8	28	0 582	16 30	0	16 30
9	22	0 544	11 97	135	146 97
10	22	0 508	11 18	0	11 18
					523 33

TABLE 5 - OPTION 2

Year	Actual Cost of Losses $1,000's	Present Value Factor From Table 1	Present Value of Losses $1,000's	Present Value of Capital $1,000's	Present Value Totals $1,000's
1	28	0 935	26 18	0	26 18
2	26	0 873	22 70	135	157 70
3	26	0 816	21 22	0	21 22
4	26	0 763	19 84	0	19 84
5	26	0 713	18 54	0	18 54
6	26	0 666	17 32	0	17 32
7	26	0 623	16 20	0	16 20
8	21	0 582	12 22	198	210 22
9	21	0 544	11 42	0	11 42
10	21	0 508	10 67	0	10 67
					509 30

TABLE 6 - OPTION 3

Year	Actual Cost of Losses $1 000's	Present Value Factor From Table 1	Present Value of Losses $1 000's	Present Value of Capital $1,000's	Present Value Totals $1,000's
1	28	0 935	26 18	0	26 18
2	16	0 873	13 97	324	337 97
3	16	0 816	13 06	0	13 06
4	16	0 763	12 21	0	12 21
5	16	0 713	11 41	0	11 41
6	16	0 666	10 66	0	10 66
7	16	0 623	9 97	0	9 97
8	15	0 582	8 73	198	206 73
9	15	0 544	8 16	0	8 16
10	15	0 508	7 62	0	7 62
					643 95

COMMENTS

Option 2 emerges with the lowest present value cost by

$14,000 from Option 1
and $135,000 from Option 3

Option 2 also has the advantage of having the lowest initial capital outlay

Option 2 represents a more conservative approach in the event that further transformer capacity is not required until sometime after Year 8

12. FURTHER CONSIDERATIONS

When investment or organisational changes are being considered care must be taken to evaluate all financial effects to the company It can often be overlooked that other departments of the company may profit or suffer loss as a direct or indirect outcome of the project under consideration As an example of this effect, the same three options are again considered but this time adding in the effect of tax allowances on capital investment These more complex example calculations can be found in Attachment C which a printout of a complete working spreadsheet The results of these calculations can be seen in Table 7

TABLE 7 - THE EFFECTS OF TAX ALLOWANCES

		TOTAL PRESENT VALUE	
	OPTIONS	**EXCLUDING TAX ALLOWANCE $1,000's**	**INCLUDING TAX ALLOWANCE $1,000's**
1	Uprate A to 2x5 MVA Uprate B to 2x5 MVA	523 33	231 54
2	Uprate B to 2x5 MVA Uprate A to 2x5 MVA	509 30	261 94
3	New 1x5 MVA station at C Uprate A to 2x5 MVA	642 95	68 06

COMMENTS

1 When the tax allowance for capital expenditure is included in the analysis, Option 3 becomes the option of choice by a considerable margin and indeed Option 2 moves from first to last place
2 The dramatic change in the outcome of the analysis is due to Option 3 incurring a very large capital investment in Year 2 and the resulting tax allowances in the succeeding years overshadow all other benefits
3 The tax example is included to illustrate that a broader view of the benefits which accrue to the company can dramatically alter the accurate analysis of the capital investment

13 GENERALISED METHOD OF COMPARISON OF OPTIONS.

This method of analysis can be used to compare any schemes whether capital investment is involved or not Whenever a company decision results in a financial effect which can be forecast over several years then the various resulting revenue streams, whether positive or negative, can be compared taking account of the time value of the benefits or costs

14 NON-QUANTIFIABLE BENEFITS.

In a project evaluation not all the benefits are directly quantifiable in monetary terms There are non-quantifiable benefits, such as compliance with supply quality standards, increased safety etc , which need to be factored into the evaluation of a project A final decision necessarily involves some element of judgement

15 RESIDUAL VALUES.

Electrical plant on the system is subject to deterioration and eventual replacement The Accountancy function must take cognisance of this and make provision to write-off equipment after a given number of years (Depreciation Period) This is usually less than the expected average physical life When the item of plant is removed or replaced before its 'write-off' period it should be accorded a Residual Value This value should be the amount obtained from the disposal of the asset even if it means the 'scrap' or material content value of the plant An alternative approach is to include as a residual credit a discounted value for future cash inflows from the project

Where an item of equipment is replaced and used elsewhere on the system then the costing scheme for the project should be credited with the present value of that residual value of the released equipment at that time, having regard to the un-expired portion of its average life expectancy

16. DISCOUNTED CASH FLOW.

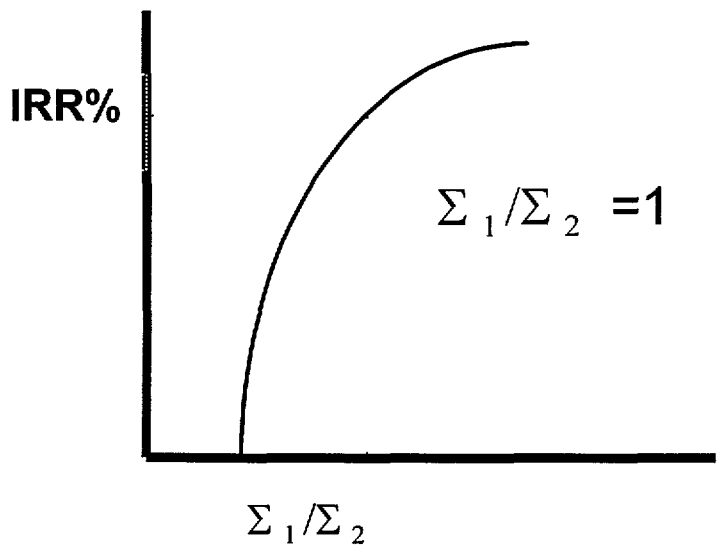
The above techniques are based on the comparison of different options each with the same rate of interest They only take account of capital investment losses, maintenance and continuity They do not consider income It was not possible therefore to assess the rate of return on the capital investment employed in the option with the lowest present worth This is called the Required Rate of Return (RRR)

16 1 Required Rate of Return (RRR)

Electric Utilities whether private or state need to ensure that their projects earn a required rate of return (RRR) This is usually linked to the rate of interest paid by the utility for capital borrowed to finance the project Degree of risk is not normally an input to the RRR due to the low risk of distribution system plant Normally RRR may be calculated for large housing schemes and industrial/commercial projects rather than small one-off domestic connections

16 2 Internal Rate of Return (IRR)

The calculation of the internal rate of return (IRR) is an alternative method of assessing a project's viability The Internal Rate of Return is defined as the annual rate of interest at which the discounted (Present Value) values of the cash inflows and outflows have the same gross present value over a specified period The present value of the sum of the benefits is calculated for a spread of discount rates The ratio of capital cost to the present value of the benefits S_1/S_2 is graphed against the discount rate d% When $S_1/S_2 = 1$ then the IRR is identified as depicted in the figure below



This technique is used to prioritise various projects in times of financial constraint

The financial analysis techniques of NPV (Net Present Value), IRR (Internal Rate of Return) and Payback Period are now readily available on most computer based spreadsheets

17. INFLATION

The rise in the costs of resources will keep in touch with the rate of Inflation over the period of years involved Where inflation is high then it changes the present value in year 't' by a factor $(1 + a/100)^t$ where 'a' is the rate of inflation, so that it becomes ,

$$[(1 + a/100)\ (1 + d/100)]^t$$

where 'd' is the rate of interest

Where the rate of inflation is high and higher than the rate of interest then the RRR may be quite low so that it would be an advantage to borrow more investment capital in advance Conversely where the rate of inflation is low the rate of investment tends to reduce

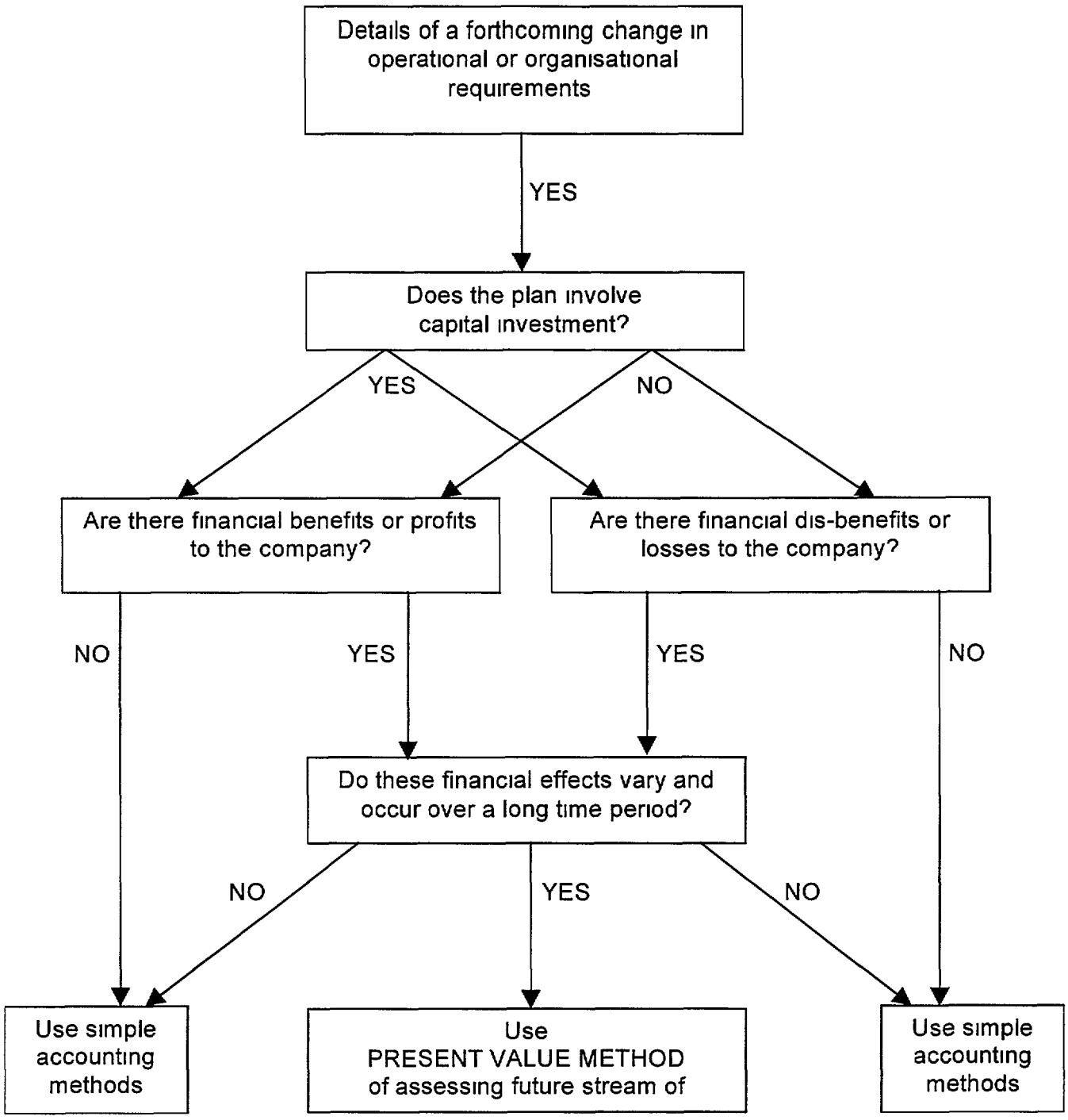
18 SENSITIVITY ANALYSIS.

Where the future is uncertain then a sensitivity analysis may be carried out This would examine the effect of a variation of any input on the total investment It would be then possible to identify the input whose variation would have the greatest effect on the investment A range of outcomes can then be calculated The demonstration spreadsheet which accompanies this method could be used for this purpose For example changing the rate of return percentage at the head of the first sheet would re-calculate the effect of this change automatically

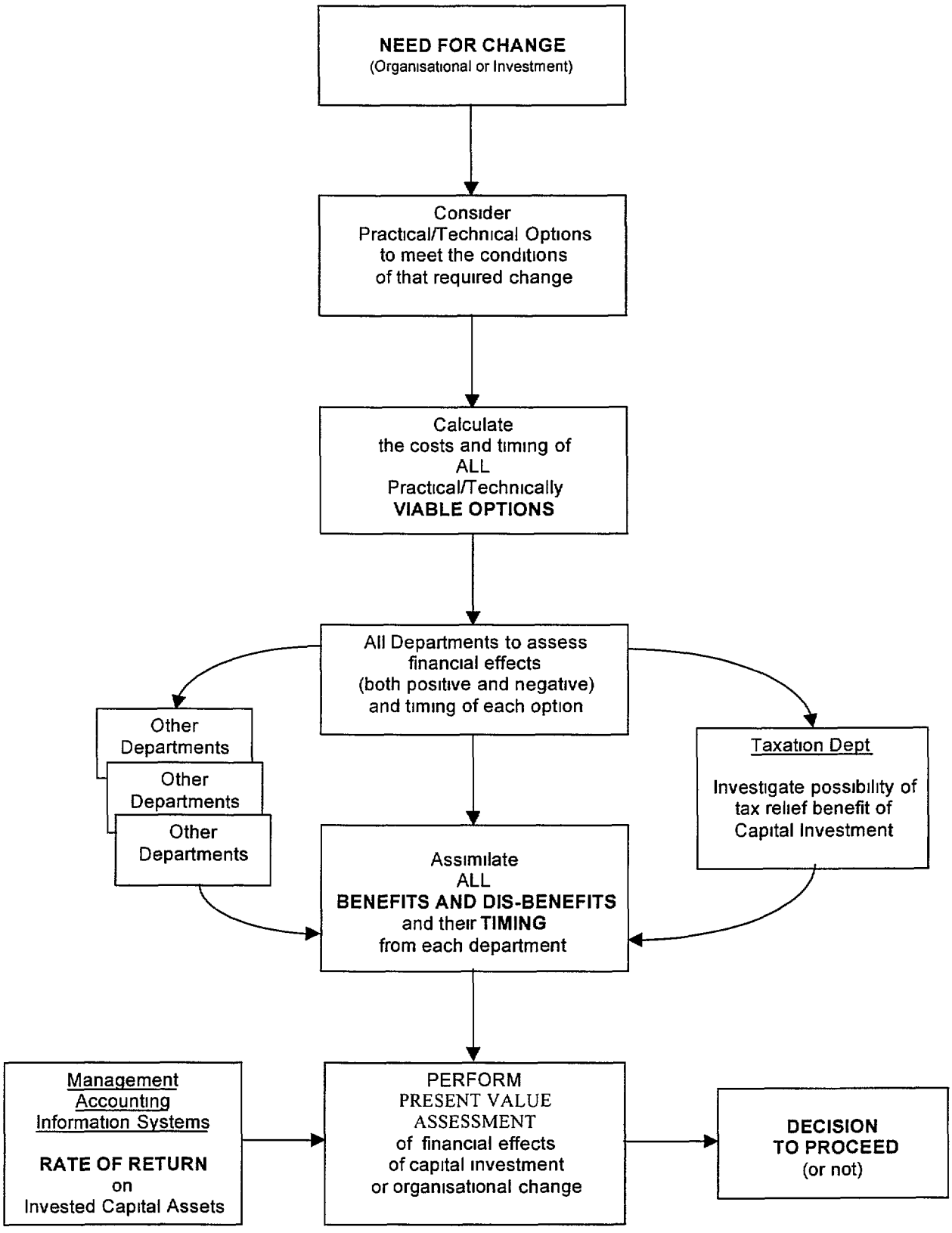
19. RISK FACTOR.

A simplistic solution to risk is to insert a percentage increase on the overall investment to guard against any unforeseen contingency This is a very primitive approach as it requires the project to make a greater profit in order to reduce the possibility of loss It would distort the cash flow leading to an incorrect evaluation of results

WHEN TO USE PRESENT VALUE ASSESSMENT

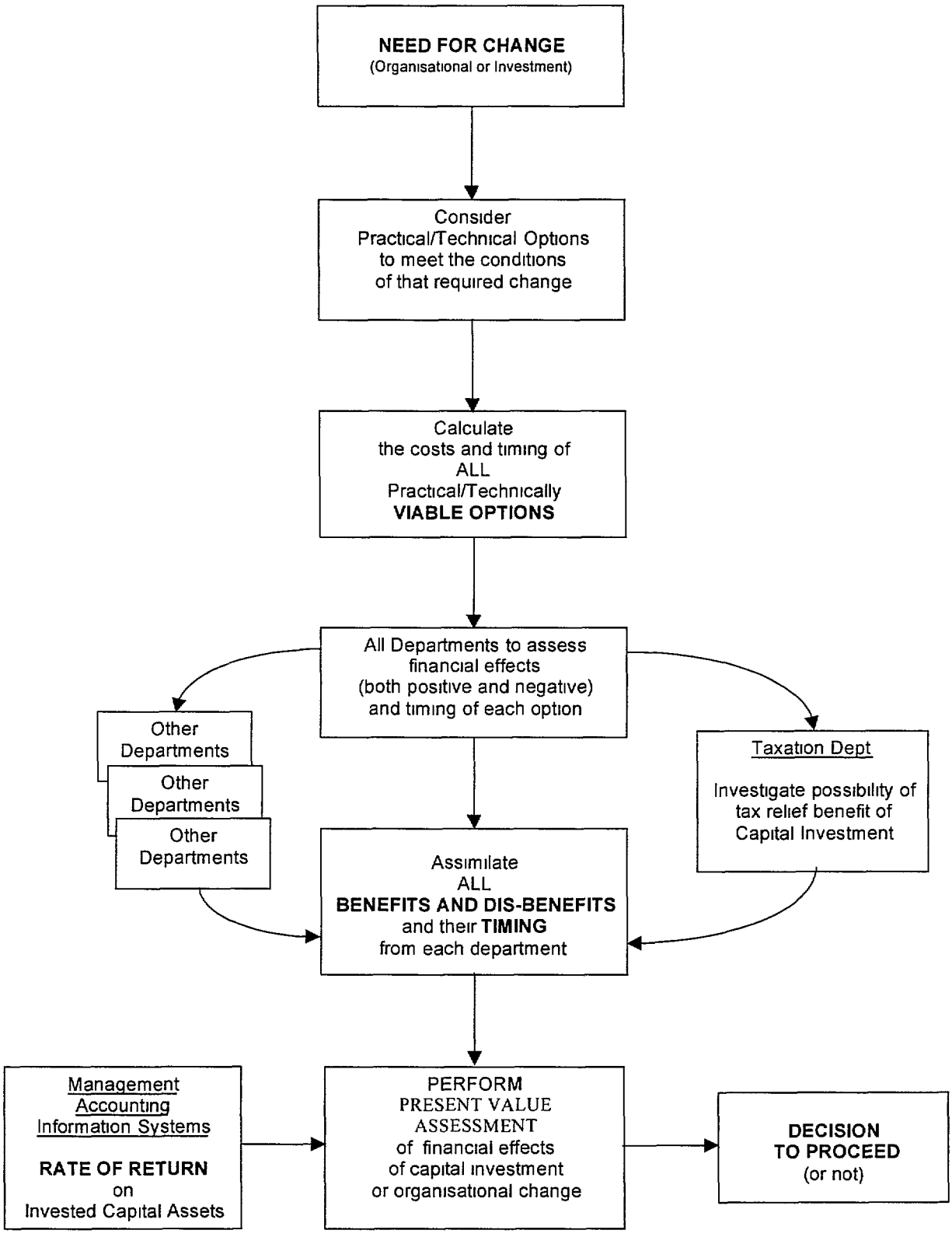


THE "PRESENT VALUE" ASSESSMENT PROCESS



ATTACHMENT B

THE "PRESENT VALUE" ASSESSMENT PROCESS



ATTACHMENT C

SPREADSHEET TO DEMONSTRATE ANALYSIS OF CAPITAL INVESTMENT OPTIONS

Summary Sheet

Required Rate of Return on capital assets | 7 % | Set this figure to automatically feed into all PV calculations

Option	Action	Year	Capital Cost $1,000	PV Assessment $1,000	PV with Tax allowances $1,000
1	Uprate A to 2x5 MVA	2	198		
	Uprate B to 2x5 MVA	9	135	523	231 54
2	Uprate B to 2x5 MVA	2	135		
	Uprate A to 2x5 MVA	8	198	509	261 94
3	New 1 x 5MVA s/stn at C	2	324		
	Uprate A to 2x5 MVA	8	198	644	68 06

Option 1

Year	Actual Cost of Losses $1,000's	Present Value Factor From Table 1	Present Value of Losses $1,000's	Present Value of Capital $1,000's	Present Value Totals $1,000's
1	28	0 935	26 18	0	26 18
2	28	0 873	24 44	198	222 44
3	28	0 816	22 85	0	22 85
4	28	0 763	21 36	0	21 36
5	28	0 713	19 96	0	19 96
6	28	0 666	18 65	0	18 65
7	28	0 623	17 44	0	17 44
8	28	0 582	16 30	0	16 30
9	22	0 544	11 97	135	146 97
10	22	0 508	11 18	0	11 18
	268		190 33	333 00	523 33

Notes 1 The Rate of Return chosen on the Summary sheet is automatically used in this table
2 Capital Expenditure is calculated NOW and so is already at Present Value

Option 2

Year	Actual Cost of Losses $1 000's	Present Value Factor From Table 1	Present Value of Losses $1,000's	Present Value of Capital $1,000's	Present Value Totals $1,000's
1	28	0 935	26 18	0	26 18
2	26	0 873	22 70	135	157 70
3	26	0 816	21 22	0	21 22
4	26	0 763	19 84	0	19 84
5	26	0 713	18 54	0	18 54
6	26	0 666	17 32	0	17 32
7	26	0 623	16 20	0	16 20
8	21	0 582	12 22	198	210 22
9	21	0 544	11 42	0	11 42
10	21	0 508	10 67	0	10 67
	247		176 30	333	509 30

Option 3

Year	Actual Cost of Losses $1,000's	Present Value Factor From Table 1	Present Value of Losses $1,000's	Present Value of Capital $1 000's	Present Value Totals $1 000's
1	28	0 935	26 18	0	26 18
2	16	0 873	13 97	324	337 97
3	16	0 816	13 06	0	13 06
4	16	0 763	12 21	0	12 21
5	16	0 713	11 41	0	11 41
6	16	0 666	10 66	0	10 66
7	16	0 623	9 97	0	9 97
8	15	0 582	8 73	198	206 73
9	15	0 544	8 16	0	8 16
10	15	0 508	7 62	0	7 62
	169		121 95	522	643 95

Capital Expenditure Tax Allowances

Assumes network capital assets fall into Group1 of Tax classification

Depreciation rate	5% p a
ie book cost reduction per year	
Basic Tax Rate	30%

B(a) = B(a-1) + P(a-1) - C(a-1) - A(a-1)

Book Cost (start of current period)	B(a)
Book Cost (start of previous period)	B(a-1)
Expenses (acquisition or major repair)	P(a-1)
Book Cost of Assets Phased Out (in previous period)	C(a-1)
Amount of Depreciation (accrued in previous period)	A(a-1)

Initial book cost includes all contruction expenses

Example

Year	Start Value B(a-1)	Expenses P(a-1)	Phased out Value C(a-1)	Deprec'n A(a-1)	Book Value B(a)	Tax Saving	PV Factor	PV
0					100	0 0	0 00	0 0
1	100	0	10	5	85	25 5	0 935	23 8
2	85	0	0	4	81	24 2	0 873	21 1
3	81	0	0	4	77	23 0	0 816	18 8
4	77	0	0	4	73	21 9	0 763	16 7
5	73	10	0	4	79	23 8	0 713	16 9
6	79	0	0	4	75	22 6	0 666	15 0
7	75	0	0	4	72	21 5	0 623	13 4
8	72	0	0	4	68	20 4	0 582	11 9
9	68	0	0	3	65	19 4	0 544	10 5
10	65	10	0	3	71	21 4	0 508	10 9
								159 1

Option 1 with Tax Allowances

Year	Cost of Losses $1 000's	PV Factor	PV of Losses $1,000's	PV of Capital $1 000's	Start Value B(a-1)	Expenses P(a-1)	Phased out Value C(a-1)	Rate 5% Deprec'n A(a-1)	Book Value B(a)	Rate 30% Capital Allowances for Tax	PV of Capital Allowances	Present Value Totals $1,000's
									0 00	0 0		
1	28	0 935	26 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	26 2
2	28	0 873	24 4	198 0	0 0	0 0	30 0	0 0	168 0	50 4	44 0	178 4
3	28	0 816	22 8	0 0	168 0	0 0	0 0	8 4	159 6	47 9	39 1	(16 2)
4	28	0 763	21 4	0 0	159 6	0 0	0 0	8 0	151 6	45 5	34 7	(13 3)
5	28	0 713	20 0	0 0	151 6	0 0	0 0	7 6	144 0	43 2	30 8	(10 8)
6	28	0 666	18 6	0 0	144 0	0 0	0 0	7 2	136 8	41 1	27 3	(8 7)
7	28	0 623	17 4	0 0	136 8	0 0	0 0	6 8	130 0	39 0	24 3	(6 9)
8	28	0 582	16 3	0 0	130 0	0 0	0 0	6 5	123 5	37 0	21 6	(5 3)
9	22	0 544	12 0	135 0	123 5	0 0	25 0	6 2	227 3	68 2	37 1	109 9
10	22	0 508	11 2	0 0	227 3	0 0	0 0	11 4	216 0	64 8	32 9	(21 7)
	268		190 33	333								
										Total Present Value		231 54

Option 2 with Tax Allowances

Year	Cost of Losses $1 000's	PV Factor	PV of Losses $1 000's	PV of Capital $1,000's	Start Value B(a-1)	Expenses P(a-1)	Phased out Value C(a-1)	Rate 5% Deprec'n A(a-1)	Book Value B(a)	Rate 30% Capital Allowances for Tax	PV of Capital Allowances	Present Value Totals $1,000's
									0 00	0 0		
1	28	0 935	26 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	26 2
2	26	0 873	22 7	135 0	0 0	0 0	25 0	0 0	110 0	33 0	28 8	128 9
3	26	0 816	21 2	0 0	110 0	0 0	0 0	5 5	104 5	31 4	25 6	(4 4)
4	26	0 763	19 8	0 0	104 5	0 0	0 0	5 2	99 3	29 8	22 7	(2 9)
5	26	0 713	18 5	0 0	99 3	0 0	0 0	5 0	94 3	28 3	20 2	(1 6)
6	26	0 666	17 3	0 0	94 3	0 0	0 0	4 7	89 6	26 9	17 9	(0 6)
7	26	0 623	16 2	0 0	89 6	0 0	0 0	4 5	85 1	25 5	15 9	0 3
8	21	0 582	12 2	198 0	85 1	0 0	30 0	4 3	248 9	74 7	43 5	166 8
9	21	0 544	11 4	0 0	248 9	0 0	0 0	12 4	236 4	70 9	38 6	(27 2)
10	21	0 508	10 7	0 0	236 4	0 0	0 0	11 8	224 6	67 4	34 2	(23 6)
	247		176 30	333								261 94

Option 3 with Tax Allowances

Year	Cost of Losses $1,000's	PV Factor	PV of Losses $1,000's	PV of Capital $1,000's	Start Value B(a-1)	Expenses P(a-1)	Phased ou Value C(a-1)	Rate 5% Deprec'n A(a-1)	Book Value B(a)	Rate 30% Capital Allowances for Tax	PV of Capital Allowances	Present Value Totals $1 000's
									0 00	0 0		
1	28	0 935	26 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	26 2
2	16	0 873	14 0	324 0	0 0	0 0	0 0	0 0	324 0	97 2	84 9	253 1
3	16	0 816	13 1	0 0	324 0	0 0	0 0	16 2	307 8	92 3	75 3	(62 3)
4	16	0 763	12 2	0 0	307 8	0 0	0 0	15 4	292 4	87 7	66 9	(54 7)
5	16	0 713	11 4	0 0	292 4	0 0	0 0	14 6	277 8	83 3	59 4	(48 0)
6	16	0 666	10 7	0 0	277 8	0 0	0 0	13 9	263 9	79 2	52 7	(42 1)
7	16	0 623	10 0	0 0	263 9	0 0	0 0	13 2	250 7	75 2	46 9	(36 9)
8	15	0 582	8 7	198 0	250 7	0 0	30 0	12 5	406 2	121 9	70 9	135 8
9	15	0 544	8 2	0 0	406 2	0 0	0 0	20 3	385 9	115 8	63 0	(54 8)
10	15	0 508	7 6	0 0	385 9	0 0	0 0	19 3	366 6	110 0	55 9	(48 2)
	169		121 95	522								68 06

TABLE 1 PRESENT VALUE OF $1 IN 1 TO 15 Years

Year	Nett Discount Rate					
	5%	6%	7%	8%	9%	10%
1	0 952	0 943	0 935	0 926	0 917	0 909
2	0 907	0 890	0 873	0 857	0 842	0 826
3	0 864	0 840	0 816	0 794	0 772	0 751
4	0 823	0 792	0 763	0 735	0 708	0 683
5	0 784	0 747	0 713	0 681	0 650	0 621
6	0 746	0 705	0 666	0 630	0 596	0 565
7	0 711	0 665	0 623	0 584	0 547	0 513
8	0 677	0 627	0 582	0 540	0 502	0 467
9	0 645	0 592	0 544	0 500	0 460	0 424
10	0 614	0 558	0 508	0 463	0 422	0 386
11	0 585	0 527	0 475	0 429	0 388	0 351
12	0 557	0 497	0 444	0 397	0 356	0 319
13	0 530	0 469	0 415	0 368	0 326	0 290
14	0 505	0 442	0 388	0 341	0 299	0 263
15	0 481	0 417	0 362	0 315	0 275	0 239

TABLE 2 PRESENT VALUE OF ANNUAL LOSSES OF $1

Period Ahead (yrs)	Nett Discount Rate 5%	6%	7%	8%	9%	10%
2	1 86	1 83	1 81	1 78	1 76	1 74
3	2 72	2 67	2 62	2 58	2 53	2 49
4	3 55	3 47	3 39	3 31	3 24	3 17
5	4 33	4 21	4 10	3 99	3 89	3 79
6	5 08	4 92	4 77	4 62	4 49	4 36
7	5 79	5 58	5 39	5 21	5 03	4 87
8	6 46	6 21	5 97	5 75	5 53	5 33
9	7 11	6 80	6 52	6 25	6 00	5 76
10	7 72	7 36	7 02	6 71	6 42	6 14
11	8 31	7 89	7 50	7 14	6 81	6 50
12	8 86	8 38	7 94	7 54	7 16	6 81
13	9 39	8 85	8 36	7 90	7 49	7 10
14	9 90	9 30	8 75	8 24	7 79	7 37
15	10 38	9 71	9 11	8 56	8 06	7 61

Calculation of Present Value Factors

Years Ahead	5% Compound Interest	PV Factor	Cumulative By Addition	Cumulative fx PV	6% Compound Interest	PV Factor	Cumulative PV
0	1 000	1 000		0 000	1 000	1 000	0 000
1	1 050	0 952	0 952	0 952	1 060	0 943	0 943
2	1 103	0 907	1 859	1 859	1 124	0 890	1 833
3	1 158	0 864	2 723	2 723	1 191	0 840	2 673
4	1 216	0 823	3 546	3 546	1 262	0 792	3 465
5	1 276	0 784	4 329	4 329	1 338	0 747	4 212
6	1 340	0 746	5 076	5 076	1 419	0 705	4 917
7	1 407	0 711	5 786	5 786	1 504	0 665	5 582
8	1 477	0 677	6 463	6 463	1.594	0 627	6.210
9	1 551	0 645	7 108	7 108	1 689	0 592	6 802
10	1 629	0 614	7 722	7.722	1 791	0 558	7 360
11	1 710	0 585	8 306	8 306	1 898	0 527	7 887
12	1 796	0 557	8 863	8 863	2 012	0 497	8 384
13	1 886	0 530	9 394	9 394	2 133	0 469	8 853
14	1 980	0 505	9 899	9 899	2 261	0 442	9 295
15	2 079	0 481	10 380	10 380	2 397	0 417	9 712

Inverse of compound interest method to produce PV factors

7% Compound Interest	PV Factor	Cumulative PV	8% Compound Interest	PV Factor	Cumulative PV	9% Compound Interest	PV Factor	Cumulative PV
1 000	1 000	0 000	1 000	1 000	0 000	1 000	1 000	0 000
1 070	0 935	0 935	1 080	0 926	0 926	1 090	0 917	0 917
1 145	0 873	1 808	1 166	0 857	1 783	1 188	0 842	1 759
1 225	0 816	2 624	1 260	0 794	2 577	1 295	0 772	2 531
1 311	0 763	3 387	1 360	0 735	3 312	1 412	0 708	3 240
1 403	0 713	4 100	1 469	0 681	3 993	1 539	0 650	3 890
1 501	0 666	4 767	1 587	0 630	4 623	1 677	0 596	4 486
1 606	0 623	5 389	1 714	0 583	5 206	1 828	0 547	5 033
1 718	0 582	5 971	1 851	0 540	5 747	1 993	0 502	5.535
1 838	0 544	6 515	1 999	0 500	6 247	2 172	0 460	5 995
1 967	0 508	7 024	2 159	0 463	6 710	2 367	0 422	6 418
2 105	0 475	7 499	2 332	0 429	7 139	2 580	0 388	6.805
2 252	0 444	7 943	2 518	0 397	7 536	2 813	0 356	7 161
2 410	0 415	8 358	2 720	0 368	7 904	3 066	0 326	7 487
2 579	0 388	8 745	2 937	0 340	8 244	3 342	0 299	7 786
2 759	0 362	9 108	3 172	0 315	8 559	3 642	0 275	8.061

10% Compound Interest	PV Factor	Cumulative PV	11% Compound Interest	PV Factor	Cumulative PV	12% Compound Interest	PV Factor	Cumulative PV
1 000	1 000	0 000	1 000	1 000	0 000	1 000	1 000	0 000
1 100	0 909	0 909	1 110	0 901	0 901	1 120	0 893	0 893
1 210	0 826	1 736	1 232	0 812	1 713	1.254	0 797	1 690
1 331	0 751	2 487	1 368	0 731	2 444	1 405	0 712	2 402
1 464	0 683	3 170	1 518	0 659	3 102	1 574	0 636	3 037
1 611	0 621	3 791	1 685	0 593	3 696	1 762	0 567	3 605
1 772	0 564	4 355	1 870	0 535	4 231	1.974	0 507	4 111
1 949	0 513	4 868	2 076	0 482	4 712	2 211	0 452	4 564
2 144	0 467	5 335	2 305	0 434	5 146	2 476	0 404	4 968
2 358	0 424	5 759	2 558	0 391	5 537	2 773	0 361	5 328
2 594	0 386	6 145	2 839	0 352	5 889	3 106	0 322	5 650
2 853	0 350	6 495	3 152	0 317	6 207	3 479	0 287	5 938
3 138	0 319	6 814	3 498	0 286	6 492	3 896	0 257	6 194
3 452	0 290	7 103	3 883	0 258	6 750	4 363	0 229	6 424
3 797	0 263	7 367	4 310	0 232	6 982	4 887	0 205	6 628
4 177	0 239	7 606	4 785	0 209	7 191	5 474	0 183	6 811

13% Compound Interest	PV Factor	Cumulative PV	14% Compound Interest	PV Factor	Cumulative PV	15% Compound Interest	PV Factor	Cumulative PV
1 000	1 000	0 000	1 000	1 000	0 000	1 000	1 000	0 000
1 130	0 885	0 885	1 140	0 877	0 877	1 150	0 870	0 870
1 277	0 783	1 668	1 300	0 769	1 647	1 323	0 756	1 626
1 443	0 693	2 361	1 482	0 675	2 322	1 521	0 658	2 283
1 630	0 613	2 974	1 689	0 592	2 914	1 749	0 572	2 855
1 842	0 543	3 517	1 925	0 519	3 433	2 011	0 497	3 352
2 082	0 480	3 998	2 195	0 456	3 889	2 313	0 432	3 784
2 353	0 425	4 423	2 502	0 400	4 288	2 660	0 376	4 160
2 658	0 376	4 799	2 853	0 351	4 639	3 059	0 327	4 487
3 004	0 333	5 132	3 252	0 308	4 946	3 518	0 284	4 772
3 395	0 295	5 426	3 707	0 270	5 216	4 046	0 247	5 019
3 836	0 261	5 687	4 226	0 237	5 453	4 652	0 215	5 234
4 335	0 231	5 918	4 818	0 208	5 660	5 350	0 187	5 421
4 898	0 204	6 122	5 492	0 182	5 842	6 153	0 163	5 583
5 535	0 181	6 302	6 261	0 160	6 002	7 076	0 141	5 724
6 254	0 160	6 462	7 138	0 140	6 142	8 137	0 123	5 847

ATTACHMENT D

INVESTMENT PLANNING ASSESSMENT

Selection Criteria for Sample Projects

This method for assessing and comparing investment options is designed for projects which result in financial benefits or dis-benefits spread over a period of years It assumes that the practical and technical decisions are adequately decided by staff already trained and experienced in this field

Therefore in selecting suitable local illustrative examples the main criteria will normally be that the project can be seen to generate long term financial benefits to the company However the method can also be used to compare the adverse effects of an unavoidable change and assess which choice of project or project timing does least harm to the company financially

Although the normal use of the method is to assess the financial results of capital investment, it can used even when there is little or no capital involved in a project or organisational change but the end result is a complex stream of financial effects over several years

In the following tables insert

- Project name
- Departments of the company involved in the overall assessment
- Description of each option being considered and for each list
    - Expenditure and its timing
    - Perceived financial benefits resulting directly or indirectly from the project and their timing
    - Financial losses or increased costs resulting from the project and their timing

COMPANY NAME _____

Project title	Option
Description of Option	
Departments involved	

Year	1	2	3	4	5	6	7	8	9	10	Comments
Expenditure											
Benefits (approx)											
Losses (approx)											

Project title	Option
Description of Option	
Departments involved	

Year	1	2	3	4	5	6	7	8	9	10	Comments
Expenditure											
Benefits (approx)											
Losses (approx)											