[Public Version]

Description of LECG revisions to the OXERA model and Responses to Analysys/Network Strategies Critique

Stuart Shepherd, Dean Nutsford

& Matthew Burgess (CRA)

14 November 2003

LECG
ECONOMICS
FINANCE

CONTENTS

1. INTRODUCTION

1.1. INTRODUCTION

1. This document is for the purpose of understanding:

   - The adjustments made to the OXERA model as presented in the LECG reports of 29 October and 13 November, and in presentations to the Commission[1], and

   - Requested details of the changes in settings in each scenario of the model.

2. This report refers to the models we used to calculate the revised OXERA results, which we have provided to the Commission.

3. We also provide responses to issues raised by Analysys/Network Strategies about our revisions to the OXERA model.

1 "Economic and Technical Critique of the OXERA Unbundling Cost Benefit Analysis – Focusing on Model Data, Calculations and Assumption", 29 October 2003; "Analysis of inconsistencies between the OXERA model and the TelstraClear Business Case", 12 November 2003.

2. DESCRIPTION OF LECG SCENARIO TESTING

4. This section describes the LECG approach to scenario testing of the OXERA model, as outlined in our October 29 submission and our November 11 presentation to the Commission.

2.1. CBA BASE CASE ADJUSTMENTS

5. All scenarios calculated in the development of the CBA analysis and scenario testing were based on an adjusted Base Case OXERA model.

6. From the spreadsheet (OXERACBA2.xls) that was received from the Commission on October 14, the following adjustments were:

- VBA code was adjusted to eliminate the cell mis-references in the OutputsSpec and OutputsDes sheets, as described in the LECG report.
- The calculation of DSLAM investments required was moved from VBA code into the spreadsheet, with the addition of a new sheet called *CalculateDSLAMs*. This was purely for speeding the calculation and its comparability to the original calculation was confirmed.
- A reference on CombOutput (at cell B8, with a user-defined name "Last") has been added which indicates the last scenario run in the model.
- Column A of the Calculations sheet has a marker added to indicate that an exchange has been unbundled using *Last* as a reference. This column is used to ensure that in all cases lines in unbundled exchanges are counted.
- A table on sheet CombOutput has been added at cells AD2:AH9 to calculate unbundled lines and lines in unbundled exchanges for the most recent scenario run. The table has one row for each scenario, which reflects the different formulas required to calculate these values under the four scenarios.
- Column HT of the Calculation sheet identifies non-competitive exchanges. Cells EZ787:FA787 of OutputsSpec and OutputsDes sheets calculate benefits in non-competitive exchanges. This column is used to calculate Cells S2:X7 of the CombOutput sheet.
- VBA code was checked for redundant instructions, with some code "commented out", with zero effect on the end result but a reduction in calculation time.

- An onset costs calculation sheet was added, called *Onset Costs*. The purpose of this sheet is to calculate the present value of the contribution to onset costs from either all DSL lines, or all unbundled lines (depending on settings), and then calculate the lump sum deduction of costs required to account for all onset costs. However, this system has been further developed in scenarios 5.1, 5.2, 6.1, 6.2, C.1 and C.2. In particular, in each of the Inputs sheets, a formula has been added to cell E83 (and others surrounding that) which calculates onset cost contribution per line. The result in cell E83 is then passed to *Onset Costs* sheet for the contribution-deduction calculation described earlier in this paragraph. The final change added for onset costs is to cell H4 in the CombOutput sheet. In scenarios 5.1, 5.2, 6.1, 6.2, C.1 and C.2 (only), the result is the sum of *Price Effect*, *Take-Up Effect* and *Onset Cost Deduction*.

2.2. MARKET SHARE

7. We calculate market share from the OXERA model as follows:

- A table on sheet CombOutput has been added at cells AD2:AH9 to calculate unbundled lines and lines in unbundled exchanges from the last run. The table has more than one row, which reflects the different formulas required to calculate these values under the four scenarios. This relies on the following features of the Base Case model:
  - A reference on CombOutput (at cell B8, with a user-defined name "Last") has been added which indicates the last scenario run in the model; and
  - Column A of the Calculations sheet has a marker added to indicate that an exchange has been unbundled using *Last* as a reference. This column is used to ensure that in all cases lines in unbundled exchanges are counted.

8. The model is otherwise unchanged from the "Base Case" model

9. Reductions to the OXERA market share reductions assumptions are effected as follows. On *Calculation* sheet, cells I4:K6:

Default:

Data parameters	Case 1	Case 2	Case 3
Churn rate (entrants gain from TCNZ)	5%	5%	5%
New subscribers (entrants gain)	25%	25%	25%
Subscribers lost to competing technologies	5%	5%	5%

50% churn reduction:

Data parameters	Case 1	Case 2	Case 3
Churn rate (entrants gain from TCNZ)	2.5%	2.5%	2.5%
New subscribers (entrants gain)	12.5%	12.5%	12.5%
Subscribers lost to competing technologies	2.5%	2.5%	2.5%

10. On *LineSubs* sheet:

Default:

Case 1 voice (bus and res)

Churn rate	5%

Case 4 PDN (Business data services)

Churn rate	10%

At 50% churn:

Case 1 voice (bus and res)

Churn rate	2.5%

Case 4 PDN (Business data services)

Churn rate	5%

- Changed formulas in Inputs sheets are generally (but not always) denoted by a cell shaded with a peach colour.

- Minor correction: Churn adjustments affect churn, uptake of new customers *and* loss of lines to rival technologies (contrary to para. 60 and Table 25 of the LECG report of 29 October).

2.3. ONSET COST CALCULATION

11. When allocating onset costs to unbundled lines only, we assumed onset costs would be spread over a number of lines that at least exceeded the number of lines that were actually unbundled. The contribution per line has to be calculated before the number of lines actually unbundled is calculated. Our rule was to increase the assumed number of lines over which per line onset costs are calculated until the assumed line count for allocation exceeded the number of lines actually unbundled. This resulted in the following:

- Full unbundling – 45,000
- Line Sharing – 20,000
- Bitstream unbundling – 45,000
- PDN unbundling – 20,000

12. Our procedure for calculating benefits from allocating onset costs to all, or to unbundled lines only, was as follows:

1. Calculate the present value of onset costs to be recovered (fixed plus PV of ongoing onset costs).

2. Divide this value by the assumed number of lines to be unbundled (340,000 or 45,000 to 20,000 for unbundled only).

3. Annualise this cost by multiplying with an annualisation factor. In the calculation for the impact of onset costs on their own, we use an annualisation factor of 0.2843 (based on OXERA 13% pre-tax WACC), to isolate the impact of onset costs from the correction of WACC. In the calculation for the combined impact of the 7 issues we raised we use an annualisation factor of 0.33 (based on a 13% post-tax WACC, which is equivalent to 19.4% pre-tax).

4. We subtract $7 per line to take out the contribution calculated by OXERA, and which they assume is included in the COVEX estimates.

5. Run the calculation.

6. Calculate the present value of onset costs actually contributed to by unbundled lines over the five years).

7. Deduct this lines contribution from the total onset costs to be recovered. The outstanding onset costs to be recovered is added to Commission costs. This amount is then deducted as a fixed amount from the estimated benefits.

8. If there is no entry then the present value of ongoing onset costs is added back to estimated benefits (we assume no ongoing onset costs when there is no entry).

2.4. GST Deduction

13. In adjusting for GST we multiply the following variables by 8/9. For example this is from the *Inputs1* sheet:

FIXED DATA RESIDENTIAL, PER LINE		**Before GST Deduction**	**After GST Deduction**
Current connection charge	C1	$99	$88
Connection charge scenario	C2	$99	$88
VOICE RESIDENTIAL FIXED PER LINE			
Current connection charge	C1	$38	$34
Connection charge scenario	C2	$38	$34
DATA RESIDENTIAL VARIABLE PER LINE			
Current (pre-entry) price (TCZN)	P0	1284	$1,141
VOICE RESIDENTIAL VARIABLE PER LINE			
Current (pre-entry) price (TCZN)	P0	471	$419

2.5. General Notes

- The correct place to look for results is "Scenario List (to Tables) 031025.xls". One function of this workbook is to remove ongoing onset costs in the event that there is no entry. Telecom has provided estimates for fixed and ongoing onset costs. If there is no unbundling in any exchange, then we assume there is no ongoing onset cost: this spreadsheet adds back in the value of ongoing onset costs not incurred. The fixed onset cost is still incurred. A second function of this workbook is to facilitate checking the outputs of the models.

- Not all reported results have their own model. For "high impact" Combined Scenarios where the "low impact" has already reported no entry, we did not produce a high impact combined model on the assumption that the minimum has already been located.

- Price calculations for use in scenarios 2.1, 2.2, 7.1 and 7.2, as well as combined scenarios, are contained in price calculation sheets with corresponding names (e.g. Price_2.1.XLS). Prices are manually transferred into corresponding Inputs sheet in the model.

2.6. Colocation Replacement Costs

14. During our conference presentation of 11 November, "Critique of OXERA Model - Focusing on Data, Calculations & Assumptions", the Commission asked for the colocation cost assumptions that were used to generate our colocation scenarios (slide 14 of the presentation). To answer this question, we provide the following information:

- Exchange site replacement cost assumptions (including operating costs) and exchange site power consumption costs used in the OXERA revisions.

- Indicative space requirements for both voice and DSLAM equipment

- Colocation market price estimates used in the OXERA revisions.

2.6.1. Replacement Cost Assumptions

15. The following table summarises the annualized investment and operating costs per square metre and power costs for exchange site buildings by ESA type.

Exchange Type	Replacement costs per annum per metre ($)	Power cost per 50 volt amps ($)
CBD	[	
Metro		
Urban		
Suburban		
Rural		]TRI

16. The replacement costs comprise annualized investment that includes land, buildings, and amenities, operating costs, rates, maintenance and property management fees.

2.6.2. Indicative Rack Space Requirements

17. The following table provides indicative space requirements for DSLAM equipment and voice equipment.

No. of Connections	No. of racks for DSLAM	Rack space requirements (m2)	No. of racks for voice Equipt.	Rack space requirements (m2)
50	1	0.7	2	1.4
100	1	0.7	3	2.1
500	1	0.7	3	2.1
1000	2	1.4	4	2.8
2500	4	2.8	8	5.6
5000	7	4.9	15	10.5
8000	11	7.7	24	16.8

18. The voice equipment space requirements are based on the estimated space requirement for 2M primary multiplexer equipment.

2.6.3. Market Price Assumptions For Colocation Space

19. Our market price assumptions for collocation space costs were based on the same information provided to the Commission by Telecom on 8 August, "Representative costs to provide LLU Telehousing space at existing exchange sites" which stated:

> *"Therefore, we estimate the opportunity cost of exchange floor space is $6630 per annum per square metre. This opportunity cost assumes that the floor space is provided in a usable manner and includes services such as fire and security alarms, rates, insurance, maintenance, property management fees, etc."*

3. RESPONSE TO ANALYSYS/NETWORK STRATEGIES REVIEW OF LECG

3.1. INTRODUCTION

20. This section addresses the critique of the LECG scenario testing raised by Analysys 14 November. We quote Analysys in an attempt to briefly outline their position, however, given the time constraints under which this response is produced we recommend reading this response in conjunction with the Analysys critique.

3.2. INCORRECT REFERENCES FOR P2 PRICES

21. **Issue**: In the Full Unbundling scenario, cell references in columns DO to DT, and DV to EA in spreadsheets OutputsSpec, and OutputsDes incorrectly reference a factual price for 2005 for the years 2006-2010. To replicate the error, run Full Unbundling designation (specification), then go to OutputsDes (OutputsSpec), then check formulas in the above columns and confirm that the cell references for years 2006 to 2010 are not referring to years 2006-2010 in Inputs1 sheet.

22. **Analysys Comments**: "We are unable to confirm that it is in fact an error" (p. 19).

23. **LECG Comment**: No further comment.

3.3. GST INCORRECTLY INCLUDED IN RESDENTIAL P0

24. **Issue**: GST for residential customers is included in counterfactual price but excluded from factual prices.

25. **Analysys Comment**: "GST should be included in all residential prices because the consumer must pay GST" (p. 20).

26. **LECG Comment**: We only consider designation but agree that the effect of GST in specification will be smaller. For designation, we accept it is reasonable to add GST to factual prices rather than deduct it from the counterfactual. As noted in our report, we expect this to have a minor effect only on our revised results.

3.4. INCORRECT ALLOCATION OF FIXED COSTS OVER FIVE YEAR PERIOD

27. **Issue**: LECG deducts return on sales for capital and annualises capital costs using an annuity approach and a WACC of 19.4%.

28. **Analysys Comment**: "While we agree that LECG's recommendation is reasonable we note that LECG has applied a 19.4% cost of capital…the OXERA cost of capital of 13% is the appropriate (pre-tax) figure." (p. 22)

29. **LECG Comment**: From the Analysys comment, we take two points:

- A pre-tax cost of capital is appropriate for use in the OXERA model; and
- 13% WACC is a pre-tax figure.

30. We agree on the first point.

31. On the second, we do not. OXERA note the source of the 13% WACC in their documentation:

> *The value for [cost of capital] is assumed to be 13% on the basis of TCNZ's submissions to the Commission in relation to the TSO (p. 48, Restricted version).*

32. All calculations of the TSO WACC use a *post*-tax WACC. For example, see "The Cost of Capital to be Applied in Calculating the Cost of the Telecommunication Service Obligation," PriceWaterhouseCoopers (22 August 2002), page 10. The equivalent *pre*-tax WACC is 19.4%

3.5. PAYBACK PERIODS

33. **Issue**: Whether five years is an appropriate economic lifetime for the recovery of some entrant costs. We note the manner in which asset lives are used in the OXERA model means this issue is one of expected payback periods on the part of the entrant.

34. **Analysys Comment**: "TelstraClear does not calculate a payback period on an asset by asset basis, but rather on a project by project basis. Thus we question the applicability iof the LECG test." (p. 24)

35. **LECG Comment**: Assuming a five year economic life is uncontroversial. In the presentation by Kevin Millar, "Meeting Customer Needs," 13 November 2003, slide 3 notes:

> *"Risk that entrant may lose customer before recovering customer connection costs means that entrants must assess new customer applications over relatively short payback period – e.g. 3 years compared to 5-15 years for core network."*

36. In his 12 November presentation for Request Pty Ltd of Australia, Mr Sykes stated that their payback period for DSLAM and infrastructure investments is five years.

37. Telecom inform us their payback periods as an entrant in Australia are 5 years or less.

38. Thus, the five year payback period used in our sensitivity test is at the longer end of what entrants appear to use in practice.

3.6. OMMISSION OF ONSET COSTS

39. **Issue**: Whether onset costs were included in COVEC benchmark prices, and whether onset costs should be explicitly considered as a cost of unbundling.

40. **Analysys Comment: "**We expect that any onset costs and ongoing unbundling costs incurred by the incumbent and passed on to the entrants have been included in the benchmarked connection and ongoing charges and therefore do not need to be included explicitly." (p. 26).

41. **LECG Comment:** COVEC is equivocal on the matter of onset costs. Our approach is to deduct a value from the COVEC prices, $7, which is consistent with OXERA assumptions elsewhere (no other approach to deduction is apparent to us), then add back an explicit and transparent contribution to onset costs which are relevant to Telecom NZ.

42. The details of our onset cost calculations under various scenarios are included in the documentation accompanying the disclosure of our scenario tests.

43. In our view, Analysys simply asserting that COVEC has incorporated onset costs without providing any evidence in support of this position is inadequate, particularly given that scenario testing has revealed onset costs to be critical to the OXERA model output.

44. The onset costs we use were provided by Telecom NZ. The reasoning for those estimates is contained in the Telecom written and oral submissions.

3.7. MARKET PENETRATION RATES

45. **Issue**: Whether 5% churn is realistic given the market share this assumption produces.

46. **Analysys Comment**: "We consider that an assumption of a constant 5% net churn over the five year period to be a conservative view…We are unable to replicate [the 28% to 47% produced by LECG]" (p. 27).

47. **LECG Comment**: Using the OXERA base case assumptions, we calculate market shares as being between 28% and 47%.

48. Both OXERA and Analysys have not been able to replicate these results and we consider it important that our calculation be made transparent, and that this result be independently confirmed by the Commission. Accordingly, we are providing to the Commission the full calculations underlying this result.

49. What is not controversial, it seems, is that market shares of 28% to 47% after five years which result from assuming 5% churn is inconsistent with overseas experience. TelstraClear indicates "5-20 percent" is realistic at para. 281 of their 27 May submission. Overseas evidence provided to the Commission by Dr. Crandall in his presentation, "Unbundling, Investment Incentives, and the Benefits of Competition," supports levels of penetration which are less than 10% after five years of unbundling. Our adjustment to 50% of the OXERA churn rates reduces the entrants' market share to 15%-26%, a band which is still higher than is supported by the overseas evidence.

3.8. COLLOCATION COSTS

50. **Issue**: Rental costs for collocation are excluded from the OXERA model.

51. **Analysys Comment**: "Analysys/Network Strategies agrees that ongoing collcation costs have not been included…However, …it appears the LECG costs are high." (p. 29)

52. **LECG Comment**: Without further analysis of the data provided by Analysys, it not possible to evaluate the comparability of overseas evidence with Teelcom. In any case, LECG is providing the Commission full disclosure of these costs in response to questions raised duriong our presentation 11 November (see section 2.6).

3.9. OTHER ISSUES

53. Analysys rasies other issues of less significance. Time constraints do not permit us to respond to these issues. Our lack of response on these issues should not be taken as our acceptance of these critiques.

APPENDIX A: SCENARIO MAP

54. This section provides a map of all scenarios tested.

Scenario	Description	All Exch	Non-Comp Only
Full unbundling			
CBA Case Case	Base Case	206.4	105.4
F1.1	Market share impact (HIGH)	0.0	0.0
F1.2	Market share impact (LOW)	64.2	0.0
F2.1	(LOW) Annualisation, pre tax WACC	133.0	67.5
F2.2	(HIGH) Annualisation, pre tax WACC With Short Asset Lives	113.2	44.4
F4.1	TSO	170.1	80.8
F5.1	(LOW) Onset costs spread over UB	(2.4)	(53.4)
F5.2	(HIGH) Onset costs spread over UB	(149.6)	(149.6)
F6.1	(LOW) Onset costs spread over ALL	161.4	56.2
F6.2	(HIGH) Onset costs spread over ALL	(139.6)	(212.7)
F7.1	Collocation (LOW) - Space	151.2	87.1
F7.2	Collocation (HIGH) Opp Cost	109.8	47.9
F8.1	GST	188.7	91.0
F_C.1	Combined (LOW)	(37.6)	(37.6)
F_C.2	Combined (HIGH)	(149.6)	(149.6)
F_C.1a	Combined (LOW) - Excl Spec	38.4	0.0
F_C.2a	Combined (HIGH) = Excl Spec	0.0	0.0
Line Sharing			
CBA Case Case	Base Case	38.2	0.0
L1.1	Market share impact (HIGH)	0.0	0.0
L1.2	Market share impact (LOW)	0.0	0.0
L2.1	(LOW) Annualisation, pre tax WACC	50.5	20.2
L2.2	(HIGH) Annualisation, pre tax WACC With Short Asset Lives	46.6	18.5
L4.1	TSO	42.6	16.6
L5.1	(LOW) Onset costs spread over UB	(37.6)	(37.6)
L5.2	(HIGH) Onset costs spread over UB	(149.6)	(149.6)
L6.1	(LOW) Onset costs spread over ALL	(12.9)	(53.4)
L6.2	(HIGH) Onset costs spread over ALL	(149.6)	(149.6)
L7.1	Collocation (LOW) - Space	37.8	0.0
L7.2	Collocation (HIGH) Opp Cost	37.1	0.0
L8.1	GST	37.8	0.0

Scenario	Description	All Exch	Non-Comp
L_C.1	(LOW) Combined	(37.6)	(37.6)
L_C.2	(HIGH) Combined	(149.6)	(149.6)
L_C.1a	Combined (LOW) - Excl Spec	0.0	0.0
L_C.2a	Combined (HIGH) = Excl Spec	0.0	0.0
Bitstream			
CBA Case Case	Base Case	151.9	90.1
B1.1	Market share impact (HIGH)	0.0	0.0
B1.2	Market share impact (LOW)	36.8	0.0
B2.1	(LOW) Annualisation, pre tax WACC	157.0	99.5
B2.2	(HIGH) Annualisation, pre tax WACC With Short Asset Lives	157.0	99.5
B4.1	TSO	130.5	76.1
B5.1	(LOW) Onset costs spread over UB	(60.6)	(60.6)
B5.2	(HIGH) Onset costs spread over UB	(182.5)	(182.5)
B6.1	(LOW) Onset costs spread over ALL	55.0	(11.6)
B6.2	(HIGH) Onset costs spread over ALL	(182.5)	(182.5)
B8.1	GST	147.8	86.4
B_C.1	(LOW) Combined	(47.2)	(83.6)
B_C.2	(HIGH) Combined	(182.5)	(182.5)
B_C.1a	(LOW) Combined	34.4	0.0
B_C.2a	(HIGH) Combined	0.0	0.0
PDN Unbundling – Specification			
CBA Base Case	Base Case	92.6	7.3
P_Spec_1.1	Market share impact (HIGH)	0.0	0.0
P_Spec_1.2	Market share impact (LOW)	42.6	0.0
P_Spec_4.1	TSO	49.8	0.0
P_Spec_5.1	(LOW) Onset costs spread over UB	(69.2)	(84.7)
P_Spec_5.2	(HIGH) Onset costs spread over UB	(180.0)	(180.0)
P_Spec_6.1	(LOW) Onset costs spread over ALL	9.7	(77.2)
P_Spec_6.2	(HIGH) Onset costs spread over ALL	(209.9)	(278.5)
P_Spec_C.1	(LOW) Combined	(41.0)	(84.7)
P_Spec_C.2	(HIGH) Combined	(180.0)	(180.0)

Scenario	Description	All Exch	Non-Comp
PDN Unbundling - Designation			
CBA Base Case	Base Case	287.2	110.6
P_Des_1.1	Market share impact (HIGH)	0.0	0.0
P_Des_1.2	Market share impact (LOW)	118.0	0.0
P_Des_4.1	TSO	261.8	103.1
P_Des_5.1	(LOW) Onset costs spread over UB	(11.8)	(87.3)
P_Des_5.2	(HIGH) Onset costs spread over UB	(182.6)	(182.6)
P_Des_6.1	(LOW) Onset costs spread over ALL	195.8	25.1
P_Des_6.2	(HIGH) Onset costs spread over ALL	9.4	(165.5)
P_Des_C.1	(LOW) Combined	32.1	(87.3)
P_Des_C.2	(HIGH) Combined	(182.6)	(182.6)