CHC Associates Pty Ltd
A.B.N. 25 081 830 506

Report to the Australian Energy Regulator

Murraylink Revised Proposal January 2013: Report on Engineering Issues

Prepared By:	Bryce Corderoy	Director
	Chris FitzGerald	Director
Reviewed By:	Warwick Grainger	Director

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1. INTRODUCTION AND SCOPE

The Australian Energy Regulator (AER) has engaged CHC Associates Pty Ltd (CHC) to provide engineering services in relation to its review of the Murraylink Transmission determination 2014-23.

Murraylink has made two Proposals:

1. **The Murraylink Revenue Proposal, May 2012**, (the "original Proposal") with supporting documents.

Subsequent changes to support documents were set out in a revision of the submission templates (V04), but were not accepted by the AER.

CHC provided a Report in October 2012 to AER in accordance with the AER's Terms of Reference, following a telephone conference and the consideration of various explanatory documents provided by Murraylink.

The AER's draft Decision dated 30th November, 2012 was cognisant of this Report, and required Murraylink to submit a Revised Proposal by 16 January 2013.

2. **Murraylink Revenue Proposal Revisions 13th January 2013**, (the "revised Proposal") with supporting documents.

CHC has participated in a process of evaluation of engineering aspects of the revised Proposal. Its brief was limited to three items, namely:

- Revised aspects of the Capex proposal;
- Engineering aspects of the Capex proposal; and
- Asset lives for refurbished plant.

The review methodology included:

- Preparation of an initial set of issues suggested as the basis for discussion with Murraylink
- Participation in a joint telephone conference with Murraylink and AER, conducted around the issues advised above, with subsequent responses advised by Murraylink.
- Supply of preliminary evaluations of aspects of the Revised Proposal
- Preparation of this Report

This Report is CHC's final response to the above aspects of the Murraylink Revenue Proposal Revisions of January 2013. It does not seek to re-canvass in detail the issues raised in the original Murraylink Revenue Proposal which have been subsequently determined by AER in its draft Decision.

2. EXECUTIVE SUMMARY

CHC has based its review and the conclusions in this report on the two Murraylink Revenue Proposals and accompanying support documents supplied as part of the Proposals, as well as other documents supplied by the proponent during the review period. Murraylink also provided information in response to specific questions from CHC that were submitted via the AER. Information was also obtained through a number of teleconferences with AER staff and Murraylink during the review period.

CHC has applied the following methodology during the total review process:

- Review characteristics of Murraylink's operating environment
- Review the Proposal and Revised Proposal together with supporting information
- Undertake independent research of selected documented proposals
- Identify issues
- Seek clarification from Murraylink and the AER
- Review industry best practice
- Comment on Proposed expenditure

The following points summarise CHC's main findings, conclusions and recommendations in the areas of Capex, Opex and Asset Management for Murraylink.

With regard to Capex items:

1 General Observations on changes between the original and revised proposals

- The cost of most capex items has increased by about 10%, reflecting the AER's acceptance of an on-cost included in the contract between Murraylink and its service provider, APA.
- Some additional items are included to purchase spare parts over the period, one of these having a significant cost.
- Some additional business cases were provided by Murraylink with the Proposal Revisions, but CHC remains concerned about the quality of the business cases for the justification of the levels of expenditure proposed.
- The split between material, labour and contract costs in future capex and opex projects is expected to be affected by a change in asset management structure described below, but the full extent of this is not evident in the documentation provided by Murraylink.

2 Ancillary Plant Refurbishment/ Replacement

- In its draft Decision the AER accepted the proposed expenditure on ancillary plant refurbishment, and agreed that it can be considered as capital in nature. CHC has not revisited this matter.
- CHC has set out areas where, in the future, there could be more detailed and comprehensive cases presented in justification of the proposed scope of work and the costs. This would be supported by improved asset management practices.
- In particular it would be advantageous to clarify the manufacturer's view of the intervals between major refurbishment of particular apparatus in the Murraylink plant. Evidence that this activity is required at all was requested but not provided.

3 IGBT Replacement Spares (new proposal)

- In response to questions Murraylink provided data on historic failure rates for these items (Insulated Gate Bipolar Transistors) to justify a prudent inventory of spares, together with a revised unit cost, resulting in a reduction in the annual cost stated in the revised Proposal.
- CHC recommends acceptance of this revision, which reduces proposed annual expenditure on these items from $83,718 per year to $69,478 per year.
- CHC considers that the change in the level and cost of IGBT replacement spares now proposed by Murraylink is an example of what can be achieved by improved record-keeping and analysis.
- CHC recommends that the spares requirement should be monitored and bench marked with other similar installations in support of future revenue proposals.

4 Other New Capex Items

- The revised Proposal added six items that were not present in the original proposal, these being SIB numbers 19a (an ancillary plant item), SIB numbers 39, 40, 41 and 43 (minor spares), and Cap 16 (half-share of an Asset Management software licence).
- These were stated to be an oversight in the original Proposal.
- CHC considers that these items are reasonable.

5 Proposed Control System Replacement (revised item)

- CHC considers that the business case for Control System Replacement presented by Murraylink provides inadequate justification for carrying out this work in the next regulatory period.
- While CHC acknowledges that a replacement of the Control System during the life of Murraylink is warranted, the replacement and its timing should be the subject of a detailed feasibility study, including various options.

With Regard to Opex Items

6 Expectation for Plant Maintenance

- The principle for scheduled maintenance set out by the plant manufacturer, ABB, in the documentation provided by Murraylink is as follows:

  "Most of the apparatus in the HVDC Light station require no scheduled maintenance (nearly free of maintenance). It means that the time between maintenance is a recommendation and this interval in most cases could be longer."

  CHC has concluded from its review of the proposals that Murraylink's maintenance program and strategies are not in accordance with this principle.

7 Cost Estimates

- The information provided by Murraylink suggests that the total future Opex costs exceed those determined by use of the agreed escalation factors
- Murraylink has stated that the new asset management structure will reduce costs in the future. This has not been carried through into the actual cost structure where costs are shown to increase.
- CHC considers there are efficiencies that can be derived from the new arrangements that are not evident in the Proposal, and that the opex amount should be capped at the escalated opex in FY 2012, which is the last full year under the previous structure.

8 Business Strategy Case for Revised Asset Management

- CHC agrees that Murraylink can change the manner in which work is carried out
- It is of concern that the new structure seems to have not been well developed, in that the expectations of savings achievable have not been fully defined.

With Regard to Asset Lives for Refurbished Plant

9 Asset Lives

- CHC does not agree that an asset management regime that requires refurbishment expenditure on plant at pre-determined intervals that are not informed by asset condition data should set asset lives.
- CHC has provided a summary table of suggested asset lives for components of the Murraylink plant, and has compared these with the standard asset life proposed by Murraylink.
- CHC has set out a series of recommended steps for the treatment of ancillary equipment refurbishment in the future

With Regard to the robustness of the Proposal

10 General observations

- CHC has significant concerns that there are deficiencies in some of the supporting material presented by Murraylink that are symptoms of the absence of a robust asset management process.
- Murraylink contends that as a small company it has not been in a position to implement such a process. However it has for many years out-sourced its asset management to APA which it claims to have significant experience in asset management.
- The FRACAS software now proposed by them as a tool for the collection and analysis of relevant data is a positive step in moving to a defensible data-based process. CHC also views the greater involvement of dedicated staff in the future asset management strategies for Murraylink to be a good initiative.
- It would be expected that at the time of the next review, information would be presented in defensible business cases and feasibility studies, especially for high cost items.

3. REVISED CAPEX PROPOSAL

3.1 Revisions in the Proposal

1. In the revised Proposal both historic and forecast costs have increased by the addition of a 10% on-cost for all amounts paid to APA as Murraylink's contractor.

2. Some additional items have been added to the forecast Capex Proposal, and the dates of some proposed expenditures have changed. Of concern is that proposed capex projects have tended to come forward in planning, effectively increasing capex costs.

3. Some additional business cases have been submitted, but CHC remains of the view that the proposed capex is not supported by robust business cases. The business cases submitted in general give an outline of causal issues only, and do not present sufficient analysis as the basis for the figures presented. Less organisational material and more detail of operational history and alternatives would assist the assessment process. There is no evidence that feasibility studies, looking at alternative actions and timing, have been considered.

4. It is noted that the capex estimates comprise a total cost per item that is uniformly disaggregated to a notional 30% material and 70% contract. There is no component attributed to the in-house labour now proposed. If this still applies to the current estimates, CHC believes a review of the cost allocation is required on account of the changed asset management arrangements. There is now a full time engineering resource and two technician/ operators that will be able to contribute to this work, and in some cases they may be able to undertake it entirely.

5. It is also noted that the entire cost of these additional resources is currently allocated to the opex function. If they are to contribute to capex then there should be a transfer of cost between these categories.

3.2 Capex for Ancillary Plant Refurbishment

CHC canvassed the issues involved in this area in our Report on the original Proposal, and notes that the AER has made a draft determination on the issue. Accordingly the following observations are made to inform future.

1. Murraylink has stated in Sect 8.3.2 in reference to reliance on manufacturer's recommendations:

   The appropriate approach in this circumstance is to follow the manufacturer's recommendations on maintenance and replacement, rather than invest in a sophisticated inspection and condition monitoring program to vary and potentially extend some maintenance intervals. This is exactly what Murraylink has done in formulating the capex and opex programs in this Proposal;

and later:

Murraylink acknowledges that reliance on the manufacturer's replacement recommendations, particularly for the refurbishment of ancillary equipment, may result in earlier maintenance activity and refurbishment of assets than an inspection and condition-based replacement regime.

In its assessment CHC sought to access directly the quoted manufacturer replacement recommendations as part of the overall review. It has not been able to do so. It is suggested that this should be required of Murraylink in the future.

2. In the absence of such evidence CHC remains of the view that no supplier's maintenance instruction for any of these items would be likely to recommend regular replacement of bearings or seals ahead of an inspection that determines this to be necessary. Accordingly it considers that the number of items that will actually require refurbishment has been substantially over-estimated. Murraylink is in the unenviable position of having to trust the judgment of its contractor, who has no incentive to minimise expenditure under the current contractual arrangements.

3. It is noted that in Murraylink's revised Proposal of January 2013 many of the actions proposed for capex items, in the category of Ancillary Equipment, are referred to as "refurbishment", but the costs seem to be consistent with the full replacement of plant items such as motors, pumps etc. rather than merely the replacement of bearings or seals. If the latter is intended by Murraylink the costs appear very high. Murraylink has advised verbally that there are high costs that can be attributed to the remote location of the Murraylink terminals. In CHC's view this has not been sufficiently substantiated or quantified, and that the change that will follow the appointment of on-site staff has not been considered.

4. While it is noted that these costs have been accepted by AER, CHC recommends that in any future submission by Murraylink the proposals for equivalent replacement programs should be supported by a more detailed analysis.

3.3 Asset Management and Capex

Murraylink contends that there is no relationship between capex and opex. Because the biggest component of capex is expenditure on the refurbishment of the existing ancillary plant CHC believes that this is not the case. Clearly the need for refurbishment is related to the extent to which plant has been maintained, so as to defer or eliminate the need for refurbishment. Consequently the implementation of an asset management regime that monitors the nature and effectiveness of maintenance through condition assessment will inevitably impact on the scope, timing and magnitude of future capex.

CHC recommends that the basis for the "Stay in Business "capex should in future be based on robust data derived from specific and appropriate asset management practices, and that progress be assessed at the next revenue determination.

As an example consider the "historic" (currently in progress) replacement/ refurbishment of half the total inventory of 106 cooling tower fan motors at a cost of $8,000 each in 2012/13, with the other half being included as Forecast Capex at a similar cost in the following year.

Prior to 2012/13 only four of these motors, described as having faulty bearings, were replaced in 2011/12 at a total cost of $18,700 or $4,675 each. Four motors represent just less than 4% of the total inventory. It would be expected that the decision to extrapolate from 4 replacements to 106 replacements should be subject to rigorous analysis and reporting. No evidence that this has occurred has been produced by Murraylink. Further, if the planned activity is refurbishment the costs would be expected to be lower, rather than higher.

CHC recommends that in a future submission a more detailed analytic approach to such decisions should be expected by the AER.

3.4 IGBT Replacement Spares

1 Insulated Gate Bipolar Transistors (IGBTs) are the basic building block of the high power valves that convert alternating current to direct current at one terminal of the link, and back to alternating current at the other end, so flexibly transferring power in either direction between the terminals. The link has 5,832 IGBT units.

2 In response to a question Murraylink produced statistics over 4 years to indicate failure rates of between 0.06% per annum, and 0.25% per annum for a later period of two years. Murraylink also notes the need to replace 29 units that have currently failed. On this basis it proposed that the purchase of 110 IGBTs over 5 years was prudent.

3 On a routine basis assuming a failure rate of 0.25% pa, this would mean approximately 15 failures per year. CHC advised Murraylink of statistics prepared on behalf of CIGRÉ [1] which indicated that historically failures of this type of device are at the lower end of the above figure (0.05%), with some at a higher level closer to that put forward by Murraylink. Murraylink stated that the IGBT units are a new technology that can be subject to higher electrical stresses than most items included in the survey results, and are therefore not relevant. However the CIGRÉ survey has been ongoing since 1968 and encompasses different technologies and it would be expected that newer technology performance would not be less than that of older technologies.

[1] CIGRÉ is the Conseil International des Grands Réseaux électriques (In English: The International Council on Large Electric Systems) It is a prestigious world organization in the field of high voltage electricity. The scope of its activities includes the technical and economic aspects of the electrical grid.

4 CHC accepts that a failure rate of 15 per year would be acceptable for budget purposes based on current knowledge. However it considers that lower failure rates are likely to predominate for this type of plant and that Murraylink should be encouraged to establish in the future more comprehensive records on IGBT performance and to bench-mark their plant's performance against other equivalent installations.

5 In response to CHC's questions Murraylink revised its estimated spares requirements, reducing the estimated annual cost from $83,718 to $69,478. CHC recommends that this be adopted as a more reasonable estimate.

3.5 Control System "End of Life" Replacement

In the original Proposal this project was included as forecast capex in 2018/19. There was considerable doubt about the cost. The AER's draft Determination was that there had been double counting and it disallowed the expenditure. The Revised Proposal includes this expenditure at a lower cost, but incurred three years earlier.

The rationale for this project was stated briefly by Murraylink in the Asset Management Plan AMP) submitted in support of its original Proposal as:

> "*The Murraylink control system consists of a variety of computerised components and software. As the components and software age, it becomes more expensive to support and maintain the system. The proposed solution is to replace the control system components*".

No Business Case was presented. CHC's position in the review of the original proposal was that, apart from the cost, the timing of the work had not been justified other than by the statement that at that date it would be 15 years old.

CHC considered that it appears reasonable that there would be a need to undertake this work at some time during the life of the plant. On past experience equipment based on industrial equipment is likely to be superseded and subsequently unmaintainable at some stage of its life depending upon the specific technology and the level of support from the equipment manufacturer. However it appears reasonable to plan for just one replacement during the life of the plant as a whole.

The equipment supplier will maintain a supply of replacement cards and will manage software issues as part of this on-going support and it would be expected that the supplier would give a sufficiently long period of notice of a decision to no longer support the control system equipment in this way. It is CHC's view that this would allow Murraylink time to develop a replacement strategy at this time.

A proposal to replace the control system in the absence of specific and definitive causation factors is seen as unjustified at this time. However it might logically be carried out at the middle of the expected life of 40 years, and so be deferred until at least the following regulatory control period. It would be expected that evidence of the withdrawal of support and a detailed business case would be presented by Murraylink at that time, including consideration of the above factors.

In its Revised Proposal, Murraylink provided a Business Case. This noted an additional concern that, "*non ABB components are out of production and compatible new components cannot be purchased. The software components are limited to operating systems that are no longer supported by the original publisher and so cannot be supported on the current computer platforms".*

If this were the case then it would already be too late to carry out the replacement.

The estimated cost for two terminals from the revised proposal is now $843,700 (in 2015/16), indicating that there was indeed double counting originally.

CHC makes the following points:

1 It is now proposed to advance the work by three years, which is directly contrary to CHC's recommendation. There is no justification presented for this and CHC cannot support the advancement as proposed.

2 A project of this size and complexity should be supported by a detailed feasibility study setting out very specifically the details of the situation, the implications for the performance of the asset and alternative proposals for action, including alternative time frames and the "do nothing" option. The business case in the revised proposal is certainly more expansive than that in the AMP but does not any of these issues. It is noted that Murraylink feels that "this project involves relatively minor expenditure". This categorisation is not acceptable.

3 As previously advised CHC accepts that this work will be appropriate at some stage but does not support the present timing in the absence of more compelling reasoning. It would be appropriate to program the work at least once during the life of the plant as a whole. This could be a matter for consideration at the next reset period, giving time for the presentation of more detailed analysis.

4 With regard to proposed costs:

- The original AMP in Item 17 identifies a replacement cost of $2,387M in 2016
- The Ancillary Data suggests a total amount of $767,000 for the two link control systems
- The Business Case in the Revised Proposal provides for a replacement cost of $843,700 in 2016, including the accepted on-cost. The source of this estimate is "quotations obtained from suppliers during 2012"

4. REVISED OPEX PROPOSAL

4.1 Limitations of CHC's Review

The Opex Proposal covers a wide range of activities that relate to the day-to-day management of the Murraylink asset, most of which are contracted to APA.

CHC's comments are limited to a subset of these activities that are aimed at maintaining the operational condition of the physical assets. In particular it concentrates on new arrangements

that include the replacement of a Head Contractor arrangement in which these activities were almost completely outsourced, to another in which many of these are managed and carried out in-house.

4.2 Opex Regime that is being replaced

Upon its conversion to a regulated asset Murraylink's opex allowance was set according to the ACCC's assessment of the efficient costs of maintaining a notional asset that was determined to be required to satisfy the Regulatory Test that was then applicable. This asset was actually a conventional Alternating Current link that bore little relationship to the true nature of the physical asset in place.

This is an example of application of a top-down approach where notional efficiency is the driver.

Murraylink has operated within this allowance. It chose to do this by contracting out engineering maintenance to an external Head Contractor that engaged sub-contractors as required. Upon change of ownership of the Murraylink asset the new owner further contracted APA to manage its relationship with the Head Contractor.

A change to this arrangement was stated by Murraylink to be prompted by the unwillingness of the Head Contractor to renew its contract with APA when it expired. Murraylink has implied that the motivation to not renew was because the contract was unprofitable, and argues that this implies that the contract costs would have been higher had the contract continued. It then argues that the previous costs should not be used to test the efficiency of the replacement arrangements. However no hard evidence has been produced to substantiate this position.

4.3 Business Case for Proposed Asset Management Strategy

A critical feature of the Revised Proposal is a change from the employment by the maintenance contractor, APA, of a Head Contractor, Transfield, for maintenance activities. The new partially in-house structure involves the employment of two technician/operators, one stationed at each terminal, and a dedicated professional engineer based at an APA office elsewhere, all under the umbrella of the parent company, APA which is Murraylink's maintenance contractor.

In addition to proposed in-house resources specialist contractors are required for transformer, circuit breaker and fire protection maintenance and for operations.

4.4 Cost items included in the Business Case

The case for the new arrangements is presented in a Table in the Business Case (re-produced as Table 8.1 in the Revised Proposal) that compares forecast costs under the new arrangements with those in the last year of the old arrangements. It is particularly noted that this analysis omits the engineering resource. This needs to be considered in the comparison.

The reason for this omission is apparently that the engineer would be concentrating mainly on the management of the "Stay in Business" capex, in which case the costs of this resource should not be included as an opex entry, but rather accounted for in the capex proposal. This has apparently not been done.

CHC suggested that the professional engineer would not be fully occupied if dedicated solely to Murraylink, and APA has proposed in correspondence that this resource can be shared equally between Murraylink and Directlink, reducing the cost by 50%. CHC recommends that this adjustment be applied irrespective of where the costs are allocated.

4.5 CHC's comments on Opex

4.5.1 Expectations for maintenance requirements

In support of its original Proposal Murraylink supplied a set of Maintenance Instructions for about 20 major plant items, together with a document written by ABB (the manufacturer) called Maintenance Instruction 1JNL100053-917. This sets out its view of the overall maintenance resource requirements.

CHC notes that in this document ABB has advised, inter alia, that

Most of the apparatus in the HVDC Light station require no scheduled maintenance (nearly free of maintenance). It means that the time between maintenance is a recommendation and this interval in most cases could be longer.

The maintenance approach taken by Murraylink does not conform to this principle.

Using the data in this document the following Specialist Tasks are identified:

- Control Specialist
- Breaker Specialist
- Transformer Specialist
- Valve Specialist
- Mechanic
- Electrician
- Helper

Murraylink will not have this span of expertise readily available under the revised arrangements. Nor is it clear that they were available under the superseded arrangement. But, as noted previously, ABB suggest that the equipment is almost maintenance free. It should be possible to carry out an equipment monitoring regime, coupled with specialist works on occasions, while at the same time not carrying out work unnecessarily. At this time the balance does not seem to be optimal and thus incurring additional, unnecessary costs.

4.5.2 Staffing

Locating permanent staff at substations or the equivalent has been found to be uneconomic in the electricity industry generally and this raises questions as to its efficiency. Murraylink claims that the concentration of work required at these terminals is much higher than at substations and that these staff will be fully occupied in undertaking minor maintenance.

CHC's analysis indicates that this would not be the case, but that the arrangement would be more economic if they were also responsible for much of the major "corrective" maintenance that was within their area of expertise. In the revised Proposal most of the "corrective" work is still allocated to Contractors. There appears to be scope for further efficiency in this regard, but it is difficult to quantify this.

Murraylink has provided a list of proposed activities to be carried out by the technician/ operators at each station. The list includes items that are not directly devoted to the required maintenance. There is evidently scope for additional replacement of contract labour for either major maintenance or capex within the area of their skill set.

Accepting that the proposed full time staff will be fully occupied the proposed labour costing is reasonable.

4.5.3 Overall Costs

The new structure should lead to real savings by Murraylink, but such savings are not reflected in projected overall opex expenditure.

In response to a query regarding perceived increased costs Murraylink stated that costs would be reduced –

> "costs *will be reduced relative to the continuation of the existing Head Contractor arrangement, with which the original contractor was not prepared to continue, at least in part because it was perceived to be unprofitable".*

This cannot be contradicted, nor can it be substantiated.

Murraylink also advised that there will be some considerable uncertainty about cost savings for a number of years. This uncertainty does not seem reasonable. It should be possible to estimate the times and costs in routine inspections and from experience determine a reasonably precise estimate as to call-out and non-routine matters. It is noted that the arrangement with Transfield lasted for a considerable period, and it is inconceivable that APA does not know what activities were undertaken.

The contracts with Wilson and ABB are agreed contract costs that are passed though. There are potential savings to be made in the future by reviewing the work content of these contracts. In particular routine aspects of transformer maintenance should be within the capability of the in-house staff.

In principle overall costs should not exceed the forward projection of the costs in the last year under the superseded arrangements.

4.5.4 Importance of an improved asset management strategy

There is a need to formalise an asset management strategy based on appropriate consideration of equipment maintenance requirements and the appropriate programs to keep performance at a high level.

The FRACAS system should assist in the systematic evaluation of equipment performance and enable progressive changes to be made to the equipment maintenance regime. The AER could consider recognising the validity of the proposed capex expenditure on the software license, while at the same time predicting efficiency benefits.

Asset management techniques have developed significantly over recent years, as scientific analysis has sought to improve performance and reliability, while at the same time reducing costs. This has occurred in industries as diverse as those of electric power and aviation. In the power industry the CIGRÉ organisation has devoted significant emphasis to asset management and condition monitoring techniques on a wide range of electric power equipment.

In its most formal structure, this has developed into Reliability Centred Maintenance (RCM), covered by a technical standard. However there are many less formal applications of this process for use in less complex situations, which still have essential features of the discipline.

Significant features are:

- The vast majority of failures are not necessarily related to age or numbers of operations.
- A program of condition monitoring should be in place.
- Procedures to handle failures are rigorous, and include consideration of the adequacy of the original purchase specification.

The adoption of such methods has been widespread in the power industry, given the high value of the assets, the pressure for performance in the electricity market and the challenging environment that exists for power station assets in particular.

The adoption of a programmed replacement strategy for asset components as a prime activity (as proposed by Murraylink) is not in accordance with such practice. Rather, modern strategy is directed to condition monitoring.

The general application to assets is suggested as follows:

1. The life of the component assets should be commensurate with the life of the parent asset, normally 40 years and certainly not less than 25 years for components of the power system.

2. The specification of equipment should be specific and rigorous so that, for example, motor bearings can, with normal maintenance, be expected to perform over the full life of the asset.
3. A program of asset maintenance is developed, reflecting manufacturer input, industry technology and condition monitoring programs.
4. The occurrence of equipment faults requires that the reasons for the failures be determined and performance statistics be analysed. Defective components may need to be replaced by more suitable designs.

In reference to the Murraylink equipment the following is noted:

- The equipment was supplied by a leading manufacturer for the power industry
- The life of the asset as a whole was predicted to be 40 years.
- The environmental and operational duties are not excessively onerous, when compared, for instance, to that prevailing in a thermal power station.

4.5.5 Murraylink's Capability to Manage its Assets

Murraylink has continued to emphasise the difference between its comparatively small operation and that of large utilities such as Electranet. CHC considers that:

- The principles of asset life cycle management are the same irrespective of the size of the utility.
- Murraylink is also informed by its contractor APA, which is stated to have significant relevant experience.
- Murraylink and its various owners have had 10 years to refine the knowledge and capacity to manage the specific assets and it is well past the time to be still asking for the cost of uncertainties to be borne by others.

5. ASSET LIVES

5.1 Industry Practice

An asset is usually defined to comprise an assembly of items of electrical plant as configured to perform a defined task. For example a transmission line between two locations would be an asset, and all the components of a switch bay that connects the line to a substation would be another asset.

In accordance with this concept the two terminal stations of Murraylink were each defined as assets, and the cable assembly between them was another asset. Each of these items currently have defined lives that are in accordance with their design and expectations of their future utilisation.

The length of life of transmission equipment is influenced by a number of factors, including:

- Type of equipment
- Manufacturing quality processes
- Duty cycle

- Operating environment
- Efficacy of asset maintenance

While determining the expected length of life of equipment is not an exact science, there has developed a body of experience and technical understanding to give confidence to a systematic approach.

5.2 Refurbished Ancillary Equipment

Murraylink has proposed a capex plan that involves refurbishing items of ancillary equipment at pre-defined intervals irrespective of technical need, and proposes to create new assets that comprise just the refurbished component of the plant, and that this should be fully depreciated over the subsequent interval which will be defined as the lifetime.

This strategy is claimed to be in accordance with the document "Accounting Policy - Property Plant and Equipment" dated 25th January 2011. It is noted that this is an APA Group policy: not the policy of Murraylink's owner. CHC is not qualified to judge whether the policy is valid or being applied correctly.

The matter is therefore discussed from the technical viewpoint of the expectation of the life of an item of ancillary plant that has been refurbished, but is not in the artificial regime of compulsory further refurbishment after a defined time.

Assuming that the refurbishment is carried out competently there should be no reason to expect that the plant would behave any differently to the original item in ex-factory condition, and this is the starting point for the following discussion. It is also assumed that the plant has been properly specified for the site conditions.

5.3 Technical Life of Ancillary Plant

There are some assets which can be expected to be replaced on a time basis, where it can be established that there is a wearing out process, with time or numbers of operations. However, in the power industry generally the approach has been to monitor, test and review asset performance and wear patterns before deciding on an estimated cyclical replacement program.

If problems become evident then decisions need to be made with respect to increased surveillance, replacement of elements causing lack of performance or total replacement. If total replacement is necessary in an early time frame then a better designed replacement may be appropriate, rather than replace like with like.

In commenting on the items requested, CHC has not had an opportunity to review the specification and suitability of the assets, but CHC derives some significant confidence from the fact that the manufacturer of the plant, ABB, is a major international supplier of power system equipment. CHC

would find it difficult to believe that components supplied for a project with a 40 year life would need comparatively frequent replacement as proposed by Murraylink.

Many years of observation and experience of asset management in power stations and similar plant has supported CHC in arriving at this conclusion.

The replacement plant lifetime needs to consider future performance based on an analysis of past maintenance and asset performance. Until this is provided it should remain at 40 years.

The replacement of plant items in excess of those that have actually failed is seen as unjustified by CHC because:

- Replacement of plant that is functioning normally will serve no useful purpose, and could potentially result in lower reliability if the replacement goes through an infant-mortality phase.
- The predicted operating duty and plant redundancy of Murraylink will allow the repair of single failures without decreasing capability.

Table 1 compares Murraylink's proposed new asset classes and standard asset lives with CHC's suggested asset life for each of the SIB ancillary item asset classes.

Table 1.

Asset class	Proposed standard asset life (Years)	Example SIB Ancillary equipment	CHC suggested asset life (years)
Ancillary 15	15	1.Cooling system blocking valve	40
		2.Chillers compressor	40
		3.Transformer cooling fan motors	40
		4.Water piping and fan coils corrosion	40
		5.Control system - Industrial computers	20
		6 Cooling system proportional valve motor	40
		7.Water piping valves	40
Ancillary 10	10	8.NSW runback capital contribution	N/A
		9.VESDA Scanner chassis	40
		10.Electric motor	40
		11.Inergen Pressure Vessel Testing	Statute Driven, assume 10 years
		12.Water piping lagging	40
		13.Motor Start Contactors	40
		14.Water tank	40
		15.Positive ventilation (Cap002)	40
		16.Not applicable	n/a
Ancillary 7	7	17.Expansion Vessel corrosion	40
		18.Fan Motor	40
		19.Pressure Vessel Inspection	Statute Driven, say 5 years
		20.Chiller and cooling system pump	40
Test equipment	10	21.Optic fibre test equipment (Cap009)	40
Other operating assets	5	22.Split system air conditioners (SIB035)	15
		23.Logic control reprogramming (Cap001)	40

Notes:

1. 40 year lives reflect an assessment that a programmed cycle of refurbishment/ replacement is not necessary during the life of the asset and that any replacement is due to an asset failure
2. The replacement of a component of an asset may not impact on the overall life of the asset. For instance, where bearings are replaced in a motor, the remaining life of the motor is unchanged.

5.4 Ancillary Equipment – A Way Forward

CHC notes that the capex program for ancillary equipment refurbishment in the next 5 year period has been approved by the AER.

CHC recommends that the asset life of the Refurbished Ancillary Plant should be in accordance with Table 1.

In addition CHC recommends the application of principles which incorporate the following:

1. Changes of seals or bearings or other minor parts should not change the depreciated life of the item listed. The life of the minor replacement parts can be ascertained from experience if it is necessary to separately list them. CHC does not believe this is necessary after incorporation into the unit of plant.

2. Future programs of intended actions should clearly indicate whether a motor, for example, is to be refurbished or replaced.

3. Murraylink should be required to develop a program for ancillary plant based on the principle set out by the plant manufacturer ABB and noted in Section 4.5.1. This means utilising resident staff to routinely monitor and record performance and maintenance outcomes and to program future activity based on the outcomes of the monitoring.

4. The costs involved in future ancillary plant maintenance should be recorded and be available for review. The present and proposed costs seem very high.