| Meeting Date | Location |
|---|---|
| 7 April 2022 | Hybrid – Powerlink Offices/Teams meeting |

## Attendees

| Name | Organisation |
|---|---|
| Mark Henley | Uniting Communities |
| Bev Hughson | Darach Energy Consulting Services |
| Chris Hazzard | St Vincent de Paul |
| Mark Grenning | EUAA |
| Andrew Broadbent | CS Energy |
| Albert Tong | AER |
| Nathaniel Dunnett | Powerlink |
| Jenny Harris | Powerlink |
| Gerard Reilly | Powerlink |
| David Gibbs | Powerlink |
| Lutfiye Manli | Powerlink |
| Roger Smith | Powerlink |
| Jules Taylor | Powerlink |

## Meeting Minutes & Actions

**Comments (C), questions (Q) and response (R)**

Meeting commenced with overview of agenda and introductions of ARR Working Group members

Agenda items:

- Line re-investment overview
- Ross-Chalumbin Deep Dive
- Site visit concept discussion
- Review of updated scope

**Line Reinvestment Approach**

Summary of the seven steps of line reinvestment process. Powerlink has some 27000 transmission line structures - most are lattice steel structures. So when we talk about structures requiring remediation we're talking about lattice steel structures with galvanised heavy and light members with nuts and bolts.

Q. You do condition assessment on a sampling basis?

R. Yes.

Q. Can you talk briefly about how you collect that and how you decide what the sample size is in a built section?

R: For a built section we have a standard sampling range – every year we have a one structure in 20 sample size but we don't start gathering information until about half way through the expected life of an asset.

We start gathering more detailed information at half-life. We do annual patrols on the ground with drive by involving visual inspection of the surface foundations to make sure everything is good from a health and safety perspective.

When it comes to more detailed inspection through helicopter flying (hovering) and climbing inspections much later (from half-life), it involves one in 20 structures mostly looking at detailed condition specifically level of corrosion.

Q. Just to clarify when you do your sample inspection of one in 20 is that consecutively or do you vary it according to what region you're in with respect to corrosivity? So for a high corrosion area would you do more than one in 20?

R. The sampling size remains the same but the frequency varies depending on the area.

R: Patrols will record any type of visual defect they can see – that's what they are there for and any discrepancy they record and take back, but they are not doing a detailed inspection at this stage, climbing to view the structure in its entirety.

R: We have designated corrosion regions A B C D E from least to highest corrosion environment.

R: Typically Brisbane is a C area, as you move out west your typically moving into A and B which last longer typically while further north and close to the coast would typically be D and E.

Q. Your inspections are typically helicopter?

R. We do some by helicopter, some by ground and some climbing and occasionally with drones.

Q. Drones different from flying patrols?

R. Yes. Our annual patrol would be generally one ground patrol and two helicopter patrols. All have their area of specialty. Choppers are good for things up high for information that you can't generally see from the ground. The ground patrols are good for looking at things around the footings for corrosion. And then there's climbing inspection which offer the best information but is also the most expensive. But there is a difference between patrols and condition monitoring. Condition monitoring is when you stop at the tower and you take your 50 detailed measuring points. A patrol is quicker and designed to identify any obvious points of concern. After half-life we combine patrols and condition monitoring.

So based on the data collected we develop a Health Index of each structure which is a percentage of the nuts and bolts in a structure at a certain corrosion grade.

Q. So it's only focused on nuts and bolts?

R. Nuts and bolts and members light and heavy. But what you usually find is that the nuts and bolts being the smallest components tend to have the lightest coating of galvanising on them. They go (corrode) first and they're the things that hold the structure together.

Q. How many bolts need to be in bad condition before there is a security issue?

R. For example 4% grade 4 corrosion of a structure would give you a Health Index of 8. You have a distribution of grades from 1 which is hardly corroded through to grade 4 which is the most heavily corroded.

Q. My question is how many bolts need to be at grade 4 before the network is at risk?

R. Well a structure with a HI of say 8 and a built section with a HI of 8 are two different questions.

R. I think in terms of how many bolts in a tower before it's at risk of collapse (worst case scenario) will depend on where those bolts are located and what condition they're in. The location of the tower and the wind grading also have an effect. It's difficult to provide an exact number that's why they have a trigger at 4% grade 4.

Q. In the example of the 244km of line between Townsville and Cairns you're saying if 4% of those bolts are classed at grade 4 what does that mean?

R. That will mean that structure will have a HI of 8.

Q. And that's 4% of the total built section?

R. No that's one tower.

Q. So that's the HI of an individual tower?

R. Correct.

Q. So how many bolts in a tower?

R. Up to 1,500 for a large structure.

Q. How many structures need to have a HI of 8 before the entire built section has a HI of 8?

R. What we're saying here is it depends on the length. When you consider Ross-Chalumbin which is a significantly long line. When we have 5% of our structures with a HI of 8 or above we will say a built section of that length has a HI of 8.

But for a shorter line say 20Km or something like that we would be prepared to tolerate a lot more structures with a HI of 8 or greater. For a shorter line of say 20km you're looking at about 40 structures so chances are you will have looked at every structure, you will know where the bad ones are because of your sampling. Coming to Ross Chalumbin where you have 250km of line you have 500 towers you have a sampling regime that says you won't have looked at every structure.

Normally when we start to prepare cases for reinvestment and action we will still have a significant unknown quantity. When we get closer to initiating a project, we go and do a bit more investigation so we have more information to make better decisions about the scope of the project.

Q. Given that the percentage of HI is higher for a shorter built section isn't that part of what the AER is saying that if you had shorter built sections you might be able to do less maintenance because you have to reach a high barrier of percentages?

R. Well there's other things that come in there as well. We've got about 350 built sections overall which have got big variations, some small ones and some very large ones. But we have a limited amount of maintenance resource which is targeted to going in and doing inspections to keep an eye on things. If we decided that we wanted to make that resource do more built sections and inspections we'd need to adjust the resource so they could cover the additional inspections and built sections.

C. That's really a capex opex trade off isn't it because we might be willing to support more condition monitoring if it means less capex.

C. I suppose what he is saying is that if you broke up a 300 km line into three 100km sections would we then wait for more nuts and bolts to be at higher corrosion levels before we took action.

R. Yes if you have smaller built sections and you have better knowledge about the situation in those built sections then you can afford to take a bit more time. These are the trade offs.

C. We'll talk about this a bit more later but this is really a trigger to look into further. It doesn't necessarily trigger that you do more work now but that you do more investigation.

C. Before we get to the point where we need to create a scope we go and do more work.

C. I understand but I would have assumed you do a continuous analysis of the optimal built section on the basis of the OPEX/CAPEX trade off.

C. Because you're telling us and the AER that the optimal way to do asset reinvestment is the way you're doing it, but to me to come to that conclusion you have to answer the question I've just asked but you haven't.

C. What you're doing is driven by your definition of built section but you haven't convinced me that your definition of built section is optimal.

C. I don't think we are letting what we classify as capex and opex drive our work.

Q. That standard CAPEX OPEX spend would be worth getting some more detail around. Whether or not you do more survey maintenance earlier on in the process or more detailed work later on in the piece you're really just putting the same expense broadly in different buckets aren't you?

R. No intuitively I don't I think if you have the data on CAPEX and OPEX trade to help decide on the optimal built section is.

R. No it probably comes back to what you were saying before if you have a larger maintenance team doing more maintenance in the condition monitoring, if you're spending more there and spending less in the detailed analysis where as if you're doing less monitoring you will spend more in the later detailed analysis.

C. No I'm talking about total OPEX versus CAPEX because if you do spend more on OPEX which provides better information on the optimal built section lengths that means that your capital cost is less because you've got a shorter built section.

C. I want to see an analysis that says what is the optimal built section and that may differ by location, terrain, tropical areas. Say a rainforest would I think have a shorter built section. I think we should focus on this because it's the likelihood of a bad HI coming early and much greater at Rocky as opposed to Ingham.

C. I think that's a fundamental issue that we want to get to the bottom of by the next meeting. How is a built section defined and is that the optimal way of doing things given the smaller sections are able to provide concentrated data.

R. The built section occurs by virtue its typically built by construction to fulfil a specific need. Historically a section of line was built at the same time, which is why it's considered one built section.

C. I think we need to be clear that whether we define something as CAPEX or OPEX does not drive the work that needs to be done.

R. For instance on a shorter built section we have a higher threshold to meet. There may well be a decision made that we need to intervene to do some maintenance or refurbishment on that line which defers the need for capital expenditure. So there is a trade-off already. But there is also a practical limit about what you can do because lines resources in Australia are a very finite commodity. So if you took it through to your theoretical optimal review it just might not be practical in terms of the resources available. But what I'm hearing is that it probably needs to be part of the scope moving forward to understand that.

C. Just trying to understand the metrics around the Health Index for a structure and the Health Index for a group of structures (built section). So understanding the standardisation of the built

section is really important. So what I'm asking is do we need to reconsider how built sections are understood around corrosion index or some other metric rather than historical construction of when they were built.

C. Potentially a way of examining this is by using the Ross-Chalumbin example again. Breaking it into theoretical smaller built sections and what would that look like.

C. Yes if everything flows from the definitions then that's logically where you should start.

Q. So do you have a relationship between the time when something has got to grade 3 and moving to grade 4? Do you have something that projects the rate of deterioration and the likely time it will take to get to grade 4?

R. Yes we do but it's complicated by the galvanising which deteriorates at a slower rate than bare steel.

Q. If the Health Index gets above the level that drives when you do your capital replacement is that not then on the presumption that you're not going to come back and do more capital replacement for a set number years after, so you have to predict what the deterioration rate will be so the Health Index does not get over the cap for at least another 10 years?

R. You're right. You're capitalising to extend the life for a certain period of time.

Q. And how do you select the 10 years rather than eight or 15?

R. Every project can be targeted depending what the future looks like.

R. Yes it will be based on planning studies to understand the enduring need for that line so you have some confidence around how long that line needs to be in service. Then it will be looked at well how bad is the line, what region are we in, there is a whole host of reasons why you would look to keep refitting rather than replacing.

R. We have internal terminology that means replacement generally means building a new structure and a new line which is usually alongside the existing structure. Refit is where we are talking about getting in and replacing nuts, bolts, members and insulators whatever we need to do to bring the standard of the asset up so it can last the extended life that we are aiming to achieve.

C. Refit is not always replacing all of those things. Sometimes it might be replacing some items. It may also involve painting. When you look at the Ross Chalumbin example some structures don't require any work. There is light, heavy and painting refit options depending on the condition of the structure and where it is located.

C. You replace all the nuts and bolts you need to based on the condition information.

Q. That was my next question is it 10 years or 10 to 20 years?

R. It will be a specific consideration for each line and where it's located. In some regions the chance of building an alternate line is so difficult because you're in the middle of the wet tropics (or something like that), you're stuck with that line and that route. So what you want to do is keep that line in a serviceable condition just beyond any reasonable life time of that galvanised steel.

R. We've got one we're currently in the middle of the RIT-T for one at Bayview Heights to Davies Creek which is in those wet tropics area and cuts through residential area and we're looking to paint the towers because it you don't paint the towers you're only going to get 10 years before you're back there doing some more work. You replace members, you replace bolts where they're corroded. You replace some items and then you paint the whole thing. That then gives you that extra maybe 10 years. That's a way of maintaining a line in these challenging areas.

C. A simple analogy is the Sydney Harbour Bridge they paint it and by the time they finish painting its time to start again.

C. Well its not as bad as that but yes you keep painting because the cost of building a new Sydney Harbour Bridge is phenomenal and in some locations the possibility of building a new line is very difficult so you do whatever you can to keep it serviceable.

C. By the same token you've got towers out west that are 60 to 70 years old and you might only be replacing some nuts and bolts because the corrosivity of that region is very low.

Q. Are all nuts and bolts the same or is there variability in the quality? Is there any technological improvements.

R. We have had bad batches before where something has gone wrong in the galvanising process so they haven't lasted as long as they should have. Whilst we source the items from reputable suppliers and we have quality assurance, sometimes there is variability.

Q. Is the same life extension approach used for the entire built section or just bits of built sections?

R. It's the same life extension for the whole built section.

C. Which gets us back to the same question which is why wouldn't you have different built sections based on life extensions. Because the 10km out of Townsville that section is going to have a different life extension to line further along say around Ingham.

C. We will cover this off in more detail when we do the deep dive into Ross-Chalumbin.

C. Ok but what I'm saying is that a structure in the dry region you only need to replace 5 bolts in the wet region you need to replace 25 bolts and both of them will last 10 years.

C. Just because a reinvestment project gets on our 10 year outlook doesn't mean it's definitely going to happen it's not locked in at that stage.

Q. With the increase in two-way flow of generation and load does that change the way you look at the Health Index?

R. The Health Index is purely from an asset perspective so the network flows wouldn't change the health index. But what it would change is the requirement for that asset and whether it's needed.

Q. I was thinking more in terms of the probability of failure and if they change? Do our conductors or insulators get burnt out if they have differing flows?

R. I don't think that is going to have an impact materially here because what we are looking at is the integrity of the structure. Generally failure would be brought on by cyclonic conditions or situations like that. The power flow through the system will adjust the life of your actual conductors (lines) but they generally have much longer life than the actual structures supporting them.

Q. What stage does the condition assessment come into the process?

R. When we are getting close to needed refit work done we will get a contractor in to do a detailed assessment of the built section so they can accurately quote for the work. Obviously there is a cost to that so you want to be careful of triggering that work. You don't want to do it too early because it has a finite life. We will set a functional scope for the delivery part of the business and they will engage a contractor to go out and do detailed assessment. We've made an assumption based on all the information we have.

Q. So we will have eyes on every tower before we finalise the scope?

R. Before we go for the final approval yes.

Q. So what are we at for Ross Chalumbin HI wise?

R. We are at about HI 6 for Ross Chalumbin. When we projected forward using a 10% sampling rate, it came back very expensive and with a very long delivery time frame. So we said we need

better information. We then instigated a 30% sampling rate to get better information. It helped a little but still came back as an expensive project. So we then instructed 100% of the towers be inspected along the line. There's a cost to that but it enables more accurate costing. So we went from $145 million which was in the original estimate and that dropped to $72.2 million with the more detailed condition information and inspection.

Q. What's your history in terms of the actual cost of a refit project compared to what the RIT-T has been?

R. Not good. We have had a lot of stops and starts with the refit program. Number of reasons for that but primarily the contractors haven't been setup to do the work that we need doing. Another issue is that refit is really unpopular work with contractors. They much prefer to build a nice new shiny line along a nice new easement with no messing around.

There has been a lot of work in our delivery arm to develop a dedicated contractor strategy. It's an area of focus for us because we need to improve the accuracy of costings.

Q. Do you have enough work to have an in-house team of contractors to carry out this work say with EQ?

R. There is lots of work currently going on around future resourcing with EQ that's an active discussion.

**Ross Chalumbin Deep Dive**

Types of intervention conducted on structure to extend life include:

- No intervention
- Light refit
- Heavy refit
- Heavy refit with painting

Reviewed access challenges of no major road access and eroded access tracks. Vision of corrosion levels and work requirements for remediation, abrasive blasting and painting.

**Risk versus compliance approach**

Summarised the risk versus compliance trade-offs that must occur in asset reinvestment using tower fall example.

Q. Do we use ALARP methodology in asset reinvestment planning (this was raised by AER rep and caused confusion as to which acronym was being used)

R. ALARP has been replaced by SFAIRP in all safety legislation and in our asset reinvestment planning driven by safety considerations.

C. We will update the glossary to include these terms.

**Review of Site Visit concept**

Visiting Rocklea and then another urban tower site with access challenges.

Q. Is there not a built section on the Sunshine Coast a little more remote to visit and get a sense of access problems without going all the way to Cairns.

R. It's possible.

R. Rocklea would be of value to get a sense of scope but we can look to find an alternative location that's more remote and come back to you.

C. What we want to see is why you are taking the approach you take and not what the AER is suggesting.

R. Will take some time to organise but wanted to get your input. Could be one day at Rocklea with a meeting and another day for a more remote visit.

**Review of updated scope**

Opened up to comments:

C. We've talked about built section and how that's defined. Do we need to be more specific in what we mean by the term 'bundling' Can you make that more explicit in scope.

C. Consideration of the built section length or definition of built section and impact on intervention timing and scale of works.

C. What's the deliverable of the review? Is it a discussion paper? How do we know what success is?

R. I think the way we looked at it once we get to formal review stage we'll make some draft recommendations. Then we'll test those recommendations. We will develop a formal report with the involvement of ARR Working Group members. Our Asset Strategies area will then be responsible for implementing the report recommendations into our processes.

Q. Is it worth us understanding what the accounting limitations regarding built section are before we go down a rabbit hole on options that aren't feasible?

R. Accounting standards set out what you can call CAPEX and OPEX. It would be worth understanding the trade-offs between CAPEX and OPEX.

C. Need to include project versus portfolio what is optimum.

**Actions from meeting**

| Action | Responsible | Timing |
|---|---|---|
| Create a strawman on key review areas worth exploring | Powerlink | May 2022 |
| Updated definition of built section | Powerlink | May 2022 |
| Organise for presentation on accounting treatment at next meeting | Powerlink | May 2022 |
| Cost benefit reviews to share as pre-reading (project pack information) | Powerlink | May 2022 |
| Collate RIT-T examples for sharing as pre-reading | Powerlink | May 2022 |
| Investigate potential locations outside of Brisbane for site visit | Powerlink | May 2022 |
| Add definitions for ALARP and SFAIRP in glossary | Powerlink | May 2022 |
| Investigate any other terms that need to be included in glossary | Working Group | Ongoing |