

Metallurgy of Overhead Lines

Reflection: points to consider

Session 1: Introduction, Structure, and Industry

What are the main drivers of my employer?

Generation, transmission, distribution; continuity of supply; safety of assets; environmental aspects; connecting more renewable energy; cost to customers..

What role do conductors have in reaching the goals?

Transfer more electrons; reduce line losses; "put them underground"...

What do I know and don't know about the overhead assets I work on?

Age of conductor fleet; types of conductors in the air; documentation; what did my predecessors do...

How will my current role/ future role and my colleagues benefit from me being on this course?

How do I describe my job at BBQ's/ to the family?

Assignment:

Review company annual report/ regulatory proposals.

Estimate the age and type of conductor fleet.

Review industry wide drivers and consider how the priorities differ in my region.

Session 2: Metallurgy of Transmission Lines

What is conductivity?

How does this vary with different atoms; mechanical deformation, time and temperature..

Strength to weight ratio

Supporting a conductor....can a conductor support itself...how much do they cost...

Coatings are for corrosion protection...how long should they last?

What differences should I expect depending on how the coating is applied...

Why are conductors stranded?

Do I have access to the standards and catalogues?

Assignment:

What conductor types are used for the different voltages in my network?

What would I base my choice on if I had to build a new line (at the same or different voltage)?

Session 3: Metallurgy Properties

How much breaking load do I need?

How many broken conductors do we have per year?

Creep and thermal expansion how are they measured?

How accurate are the tests; how much safety factor do I add?...

What causes vibrations in conductors?

Is it just wind? Do birds cause vibrations...

Does the zinc or aluminium coating on a steel wire carry a lot of current?

Could I tell the difference between AAAC and ACSR by looking at them?

Assignment:

Compare (simplistically) ACSR Mango and AAAC 1120 Phosphorus: same span (450m), same required clearance – what tower heights do you estimate.

Review product catalogue for properties and ampacity ratings. Would one have more losses?

Session 4: Line ratings

What are the most important influences on a line rating?

Resistance, energy in, energy out..

What stays reasonably constant over the length of a line and what varies quickly and slowly (and very slowly)?

Mechanical, electrical, surface, external factors...

How would an external coating or a grease influence?

What properties are altered...

How would I communicate with a sensor in the field?

What accuracy and benefit would there be in something simpler?

Assignment:

Review solar and wind distributions for some sites: eg. Melbourne, Mildura...Darwin Airport, Alice Springs, Tennant Creek

Session 5: Corrosion

What is corrosion?

What is going to corrode first?

What different corrosive environments do I work with?

Which would be worse....coastal, industrial, mine site...?

How long can/ should a conductor last in the air?

What did my predecessors design for? What do I design for?...

How different are greases?

Where do these products come from?

Assignment:

Review some case studies internally.

Would you add grease to an aluminium clad steel wire...would you grease an AAAC?

Session 6: Asset management

How many km of conductor do I have for an emergency?

Where is it stored... how is it stored... how long would it take to get to site..?

What drums are my spare conductor stored on?

How long are they stored or rotated in use...?

What do my procurement team do to manage/ add value??

Do we review suppliers physically...

How long do suppliers recommend?

Do I have adequate test reports?

Do I have emergency structures and procedures for tower failures?

Assignment:

Estimate the volume of conductor, steel and concrete for a 100/ 300km line.

How much do you store for repairs?

Session 7: Life Cycle Analysis and Environment

What is the environmental footprint of a transmission line installation?

Where do we draw the boundary for LCA?

Who pays for line losses?

Solar farms or customers...?

How big are line losses?

Compared to the construction footprint...

How different if a line is run at 100C?

How do line losses vary over short and long lines?

Assignment:

Review your technical library and access to sites to build it.

Session 8: Vibration

What is difference between blowout, aeolian vibration, galloping and sub conductor oscillation?

Do I need to be worried about all of these?

Why should I not leave conductors on sheaves for more than 24hrs?

How much damage can a little bit of wind do?

How do we attach dampers?

How are spirals different to dumbbells...

Do I know who my supplier is?

Do I have database of historical failures?

Assignment:

Review historical data

Session 9: Line design aspects

Wind speeds what maximum do I design for?

How does this vary with different atoms; mechanical deformation, time and temperature..

What is Cx and why is it important

What value(s) do I use for designs? What did my predecessors use?

What benefits do high temperature conductors have?

What is our risk profile...

How big should a bundle be?

Do I have access to the standards and catalogues?

Assignment:

Case studies relevant to participants – to discuss.

Session 10: Summary and current issues

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How will my current role/ future role and my colleagues benefit from me being on this course?

What did my predecessors do...how will I be remembered

How do I describe my job at BBQ's/ to the family?

Assignment:

Active participation in CIGRE, conferences, workshops, trade shows, discussions etc.