



Cable Health Assessment Requirements

Recommendations for a standardised approach

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1 Document Purpose

This document sets out requirements for cable health assessment activities. At the time of writing there is little in the way of standards or public guidelines exist to support the industry.

Indeximate Ltd have published this document with a creative commons CC-BY licence to enable an independent body to establish to a more formal standard – however we welcome anyone taking and using this work.

The document is written from an agnostic perspective of equipment and process and is intended to outline outcomes rather than procedures.

1.1 Relevant Background

Current standards that make reference to cable health condition assessment:

DNVGL-ST-0359: Subsea power cables for wind power plants

CIGRE-WG B1.40: Offshore Generation Cable Connections

1.2 Document Scope

The document is intended to cover the needs of subsea power cables, both AC and DC, static and dynamic and is a response to the threats and conditions that a cable is expected to see over its working life.

The document considers the health of a deployed and operational cable on the seabed. Some outcomes and techniques may well be desirable earlier in the life of the cable – e.g. during Factory Acceptance or deployment but are beyond the scope of this document.

Establishing a procedure to create a report to meet these guidelines should result in a significant jump in knowledge of the condition of the cable, enabling:

- **Preventative Maintenance:** Performing remedial or stabilisation works at locations on the cable to return it to a prior state of performance.
- **Palliative Care:** In the case of a cable that is beyond remediation and has locations that are close to failure, proper use of these guidelines will enable a lifetime extension (with a likely concurrent derating of power) either sufficient to reach pre-emptive replacement or possibly on a longer term depending on cost-benefit analysis.
- **Pre-Emptive Replacement:** Using the output of such reports to inform on condition and degradation to help anticipate failure and plan a replacement before the worst case happens

The document is intended to support all asset owners and related stakeholders:

Asset classes

- **AC Export Cables**
- **AC Inter-Array Cables**
- **DC Export Cables**
- **DC Interconnects**
- **Dynamic (Floating) cables as well as Static (seabed) cables**
- **Buried & non-buried**

Stakeholders

- **Asset Owners**
- **O&M Partners**
- **Insurance Brokers**
- **Insurers**
- **Risk Advisors**

Additional

The document contents are also expected to offer appropriate advice to a similar set of stakeholders interested in subsea telecommunication cables although likely a subset of the advice contained.

The document is intended to focus solely on the subsea aspects of the cable and therefore the starting point for consideration is typically the Transition Joint Bay (TJB). The methods arising from following guidelines may also be suitable for inspecting the land element.

The document is written from the perspective of information likely to be required by either an asset owner or partner involved in the chain of insurance. As such it considers a statement of health of the cable from the perspective of “moment in time validity”. It does additionally recognise the benefits of permanent condition monitoring over sample condition monitoring and requires those stating health to present the details of their assessment and whether it includes permanent monitoring. However, the main objective is the outcomes in terms of improved knowledge of the cable condition. Permanent monitoring without specified health outcomes is less of a benefit than a consulting assessment taken in depth.

The document is expressed in terms of outcomes rather than inputs, although reporters on health are mandated to report on the extent of their chosen input to cover the required outcomes and the degree of granularity. The authors declaration of interest in this matter arises from the benefits of distributed fibre optic sensing however this is not explicitly expressed to maintain agnosticism. The document in no way recommends specific approaches (our own included) nor specific devices. Users of this document are left to represent their own approach in terms of the ability to respond to the desired to outcomes.

2 Outcomes

The outcome of a well implemented cable health assessment will be an enhanced knowledge of the condition of the cable at as many points along the cable as the chosen technologies can achieve with a granularity again appropriate to the technology.

The author of a report should be able to identify locations of the cable which are:

- Experiencing degradation of the integrity of one or more components of the cable
 - Ideally to identify which component is degrading – e.g. armour, conductor, fibre optic
 - Ideally inform on the nature of the degradation
- Experiencing degradation of their deployment environment over that which was originally specified:
 - Burial State
 - Burial Depth
 - Free Spanning
- Suffering intrusion of the environment into the good working of the cable:
 - Fatigue
 - Abrasion
- At risk of damage due to shipping / malignant activity

In addition to providing a definite positive identification of the conditions and locations above the report should also provide a positive identification of the absence of such conditions – i.e. the report should be complete in knowledge able to provide both a clean bill of health as well as identifying troubling locations.