CIGRE Study Committee B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG N° B1.41	**Name of Convenor :** Walter Zenger (US) **E-mail address**: wzenger@usi-power.com
Technical Issues # (2): 9	**Strategic Directions # (3): 2**

The WG applies to distribution networks: Yes, Transmission and Distribution

Title of the Group: Long term performance of soil and backfill of cable systems

Scope, deliverables and proposed time schedule of the Group :

Background :

Existing and up-rated cable systems are loaded increasingly higher. This can be driven particularly by real time rating systems and by re-conductored systems with new high stress dielectrics permitting larger conductor sizes within the same duct or pipe. In all cases the higher loads result in higher operating temperatures for the backfill even if the rated operating temperatures remain the same. The higher loads will increase the cable / duct to soil interface temperatures that will impact the external thermal environment of the backfill and native soil. Depending on the aged backfill and soil condition, this can severely limit the potential capability of the technological advances.

Many of the existing circuits have been in service for 40 or more years when engineered backfills were in their infancy. Limited knowledge is available of past backfill design and how it will change over time. Recent work showed that properties have changed, such as degree of compaction and stratification of backfill components. Reason for the changed physical backfill conditions could be road vibration, ground water movement or settling.

Of particular interest is how high load conditions, change in physical properties and environmental changes will impact aged backfill and soil conditions.

As part of this work a review of an improved soil thermal stability test method shall be considered. The existing Cigre critical temperature gradient test is difficult to conduct. A current US test does not offer information on cable operating with a controlled dry region around the cable. Collaboration with IEEE / ICC would be possible to develop a better critical temperature gradient test.

Scope :

1. To review the literature (experience, history) on the subject
2. To establish the appropriate terminology and characterization parameters.
3. To review methods to measure the thermal, mechanical and chemical soil / backfill properties and stability.
4. To review methods to measure the aging and long-term stability of soil and backfill properties over system life
5. To review technical methods how to mitigate deterioration of soil and backfill conditions including moisture depletion by vegetation or other utilities
6. To evaluate the consequences, if no action is taken, such as loss of ampacity,

including cost and overheating of the cable system.
7. To integrate the information in a practical users guide.
8. To apply to extruded, paper, and paper-laminate cable systems
9. To apply to HV AC and DC land cable systems including direct buried, direct buried ducts or pipe, duct bank / manhole systems, and Horizontal Directional Drill (HDD) installations
10. To apply to HV AC and DC submarine cable systems including ploughing, jetting, trenching and HDD installations
11. To apply to MV AC cable systems of high importance

Deliverables : Technical brochure with summary in Electra, Tutorial

Time Schedule : start : March 2013 **Final report** : 2015

Comments from Chairmen of SCs concerned : B3, B4, C1, C3, D1

Approval by Technical Committee Chairman :
Date : 28/02/2013

(2) See attached table 1 – (3) See attached table 2

Table 1: Technical Issues of the TC project "Network of the Future" (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows within distribution level and to the upstream network.
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (cf. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
3	Focus on the environment and sustainability
4	Preparation of material readable for non technical audience