Association Grand Projects

Workshop TGEG'19

Technologies for Global Energy Grid

Organization: Association Grand Projects'21- AGP'21
President: Lucien Deschamps
With Technical and Scientific support of:

CIGRE, International Council on Large Electric Systems,
Jicable, International Conference on Insulated Power Cables
SEE, Society of Electricity, Electronics and Information Technologies and Communication

Thursday, 27 June 2019 - 9:00 am to 4:00 pm

Palais des congrès de Versailles
10 rue de la Chancellerie
78000 Versailles

***André Merlin** : Chairman Workshop TGEG'19*
***Gerald Sanchis** : Workshop Coordination*
L: Lecture SI: Short Intervention

9:00 Opening Ceremony

André Merlin, Past President CIGRE, Founding President RTE, AGP'21.

André Merlin welcomed the participants and introduced briefly the scope of the Workshop organized by the AGP21 association, as follow-up of the workshop held last year.

Session 1: Global electricity network studies (1)

9:15 – 10h45

Chairman: **André Merlin, Past President CIGRE, Former Founding President RTE, AGP'21**

Rapporteur: **Gerald Sanchis, RTE, Convener CIGRE, WG C1.35, France.**

1.1 L: ENTSO-E – Visibility on the European TSOs needs for the next ten years (TYNDP).

by Jean-Baptiste Paquel, ENTSO-E. Belgium

The presentation provides a picture of the transmission grid expected in Europe in the long term (by 2030, and also by 2040). It provides a quantitative cost assessment of the transmission grid. In this regard, the DC grid, and particularly the cable (subsea + underground) should take the major part of the development of the European grid.

1.2 L: The investigation and development of HVDC submarine cable

by Zhi'en Zhu, SGCC, China

The presentation shows the present research and development on HVDC submarine cable performed in China. It addresses the HVDC-VSC cable system, including the insulation material, cable and accessory.

So far, the application has reached ±320kV. Now, the investigations concern ±500kV HVDC cable. At present, the ±500kV HVDC-VSC cable system has passed the type test in China.

Higher voltages interesting long connections should investigated in a near future.

China launch a special line for PE resin to be used in cable insulation. Total world EHVDC is 13000km including 8000km in Asia.

1.3 SI : A plausible concept of Power pool for Korea based on NAPSI.

By Koo Ja-Yoon, CIGRE Korea

The presentation introduces the high potential of wind energy in Mongolia (up to 100GW that could be constructed during the next 20 years).

The NAPSI study provides an alternative solution to traditional generation by using the high potential of wind energy from Mongolia in order to supply the countries in North East Asia (China, Russia, Japan and Korea). So far, these countries are isolated from electrical point of view.

The presentation has highlighted the benefit of interconnections between these countries.

1.4 SI : Qualification of HVDC 525kV Extruded cables

By Dr Roland Zhang, Tennet, Germany

The presentation addresses the qualification of DC 525 kV extruded cables underground cable systems, needed for the German corridors projects and of DC 525 kV submarine cable systems for offshore wind connection by TenneT. It has been performed with the cooperation between the 4 German TSOs.

Regarding the Qualification of DC submarine cable, TenneT is interested in the development of 525 kV extruded cable systems. The question raised: how far one PQ test on the underground cable systems is applicable for one submarine cable system in alignment with the GTSO PQ Tests and which additional aspects has to be considered, especially regarding the offshore laying conditions.

1.5 SI: CIGRE approach to preparation to testing for various option to transmission by cables.

by M. Pierre Argaut, General Cable / Silec – CIGRE, France.

The presentation reminds us an important lack in the standardization: so far, there is no IEC standard on DC cable. Consequently, the CIGRE recommendations are the reference.
The presentation introduces the relevant publications on DC cables, including sub-marine domain.
The key question of increasing the voltage has been raised.

1.6 SI: Comparison from economic point of view between the first project of pan-European network in 1930 (by O. Oliven) and results of global network feasibility study of Cigre WG C1.35 for 2050.

by M. Kresimir Bakic, ELES, TSO, Slovenia

The presentation shows an historical view of the studies addressing the global grid scope.
It reminds us that this concept of Global Grid is not new.
However, the development of RES worldwide could provide a good opportunity to strengthen the justification of interconnections. A special focus has been made on the potential of Congo river, the second world water reservoir after the Amazon river.

1.7 SI: Interconnection of electricity networks between regions and continents, SuperGrid concept.

by: Ioannis Margaris, CTO of ADMIE Greece. General Manager Ariadne Interconnection. Vice Chairman B°D ADMIE

The presentation shows the quantity of electrical connections planned in Greece in order to provide reliable power supply to the islands, providing a sort of super-grid within Greece.
The AC connections are mainly in 150kV AC. The big project, Ariadne 1b€ - 2x 330km IPTO/ Ariadne is in DC-VSC 500kV.2x 500MW.



Session 2: Global electricity network studies (2)

11:00 – 13h00

Chairman: **Walter Zenger, USI, USA**

Rapporteur: **Pierre Argaut, General Cable / Silec – CIGRE, France.**

2.1 L: Transnational grid development supported by innovative MTDC architecture concepts.

By Paul Vinson, Serge Poullain, Martin Henriksen. SuperGrid Institute, France

The presentation illustrates how HV-MTDC based large power corridors as electricity highways would be useful to upgrade existing networks.

The development of submarine nodes may be of great interest in a middle term future. Nevertheless, this would rely on important technology development to overcome the technical locks related to component design, marinization, installation and system operation & control.

2.2 L: Global Electricity network – CIGRE results of the feasibility study with a focus on the technology needs.

by Gérald Sanchis, RTE, France.

The CIGRE feasibility study shows the added value of interconnecting the continents in comparison with keeping them separated.

The global electric network, compared to non-interconnected grids, enables the use of wind and PV sources, instead of gas generation, reducing the total cost for the worldwide community (-10%), and contributing to a reduction of CO2 emissions.

Several sensitivity analysis were performed in order to assess the robustness of the results.

However, these sensitivity analysis show good resilience of the results on the whole.

2.3 SI: What technology steps are needed for intercontinental energy exchange.

by Marc Jeroense, MJ Marcable Consulting AB, SE

With the objectives of losses limitation, where are the reasonable voltage limits keeping in mind the aspect of reliability? Losses could also be lowered by adding cable(s) in parallel, operating at the same voltage. Thus, lowering the losses but also increasing the investment cost. On the other hand, the availability will increase, which will become a more important aspect when the powers increase and when countries and continents get more interconnected.

2.4 SI: Works test of ultralong AC and DC cables

by M. Peter Mohaupt, Mohaupt High Voltage GMBH, Austria

There is an increasing demand for works test on long and ultralong cables. The author describes a test setup of a frequency tuned resonant test system, operating down to 10Hz, but maintaining the efficiency of a conventional resonant test system. The proposed solution enables routine testing of ultralong cables. The modularity of the system setup allows different combinations of voltages and currents to provide testing solutions from MV, HV to EHV cables.

2.6 SI: The vision of an interconnected world.

by Dr Zhanghua Zheng (Tony), European Office Global Energy Interconnection Development and Cooperation Organization (GEIDCO).

Global Energy Interconnection (GEI) is designed to realize the global optimal allocation of clean energy through power grid interconnection, and turn the differences in resources, time zones, seasons, and electricity prices into an endogenous power driving clean development. The core idea of GEI development is to promote the world's energy transition, from low efficiency of renewable usage to high efficiency, and from local power balance to optimal allocation over long distance and large areas. In this presentation, the origin of GEI is reviewed based on Chinese experience of the past decades.

Session 3: Technology solutions

14:00 – 16:00

Chairman: **Ray Awad, Ray Awad Inc, Canada**

Rapporteur: **Pierre Mirebeau, Nexans, France**

3.1 L: Submarine cables and installation: past, present and future technologies for interconnections

by Bjørn Sanden; Subsea & Land Systems, Nexans, Norway

Nexans presented an informative history of submarine cables, the current state of the art as well as the innovation being implemented to improve the quality and reliability.

This included design and installation aspects, Polymer rods instead of steel wires.

To be noticed that Europacable in relation with ENTSO-E, has provided a paper on the capacity of the European cable industry to face the TSOs needs for the next 10 years.

3.2 L: Submarine cable: industry progress

by Luigi Colla and Davide Pietribiasi, Prysmian.

The two authors presented the state of the art in DC and AC submarine cables.

3.3 SI: Technology solutions for addressing submarine

by Paul Penserini, RTE, France

The presentation highlights the need for developing “Repair Transition Joints” compatible with installed cable systems regardless of the cable manufacturers. Some jointing materials compatible with different cable manufacturers have been developed for some HVAC underground cables. However, there is so far a wide lack on the development of such joints for very high voltage submarine cables and HVDC cables in general.

The author recognizes that there may be some legal ramifications concerning the responsibility of the supplier.

Pierre Argaut mentioned that CIGRE would accept to start a new WG if the request is made in the next meeting.

3.4 SI : QA/QC for the EHVDC cables.

by Dr Zhang, Tennet, Germany

The author iterated the need for a vigorous QA and QC plans to be followed during manufacturing and installation of HV DC submarine cables.

3.5 SI : On Site Testing of ultralong DC cables.

by M. Peter Mohaupt, Mohaupt High Voltage GMBH, Austria

The author presents a technique that would drastically reduce the charging and discharging time of long cables during DC testing.

3,7 SI : Technology solutions for addressing submarine interconnections

By Marc Bailleul, Value Borealis Polymers, Manager Borealis Polymers N.V. Belgium

This presentation provides a perspective of the technology's developments from a leading supplier of polyolefin solutions to the wire and cable industry.

The author demonstrates the need for total cleanliness to avoid polymer contamination. A tea spoon of contaminant would compromise the quality of 2,500 km of cable in production.

3.8 SI : Discussion on global decarbonization issues and energy sector

by Kresimir Bakic, ELES , TSO, Slovenia.

The author expressed the need for decarbonization of the plant through the use of renewable electric energy production.

3.9 SI: Technology solutions for addressing submarine interconnections

by Ioannis Margaris, CTO ADMIE, General Manager Ariadne Interconnection, Vice-Chairman BoD ADMIE, Greece

The author expressed the need for submarine cables that could be installed in deep waters (more than 1 km), to connect many islands to mainland Greece.

16:00 – Closing of the Workshop

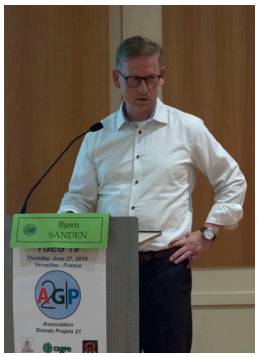
by André Merlin, Chairman, Workshop TGEG'19

As summary of the workshop, André Merlin raised two key drivers for the transmission development in the future: the citizen requests for more underground cables and the off-shore needs.

In this regard, higher voltage, and deeper sea capacity should be required for submarine links. MTDC should also provide a relevant solution for submarine grid.

André Merlin thanked all the speakers, all the participants for the quality of the presentations and of the exchanges, with a special thanks to Lucien Deschamps for the organization of the fruitful Workshop.

He announced the organization of a new workshop on Global Energy Grid, in 2020, in cooperation with CIGRE and AGP21.




[List of participants]