Project Title: Compilation of an executive instruction for commissioning, condition monitoring and maintenance test programs on AC underground XLPE cables with rated voltage from 20 kV up to 400 kV

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Project Financial Code:	630003	***Project Quality Code:***	PHVPN33
Type of Project/Program:	cost-reimbursable	***Assistant:***	Research Affairs Office

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Keywords: Condition monitoring, Shield, Environmental issues, Maintenance, Executive instruction, Corrective actions, Integration, Reliability

Project Necessity:

Population growth, urban population density, electricity consumption growth, environmental issues and urban aesthetics, and ... have increased the use of cable systems in recent years. On the other hand, the high costs of replacement of the cable system, the need for higher reliability of the power grid, the considerable time needed to plan and carry out the replacement or repair of the cable and the significant economic losses due to unplanned outage, have made management of cable asset crucial necessity.

Most important challenges in the field testing of power cable systems in Iran can be mentioned as below:

• Lack of sufficient knowledge of power cable owners about the importance of the tests at installation and maintenance times and during the operation, has led to ignore the tests and consequently, causes a considerable economic loss. Moreover, in some cases, little acquaintance with this field can lead to miss the test requirements during the design and implementation of the cable system.

• The lack of an executive instruction on installation, maintenance and condition monitoring tests of power cables, makes it possible to damage the cable system by applying excess stress during the test. Moreover, incorrect test results can also be obtained.

• The lack of a coded executive method for testing, along with a lack of a functional, integrated, and reliable reference for analyzing the test results, has led various test procedure to be used by the test executors. Therefore, not only it is expected to apply personal opinion in the analysis of the results of the tests, but also it is impossible to compare the results obtained from periodic tests, which is one of the important tools for determining the status of cable system.

In order to overcome above challenges, in this project an executive instruction on field testing of power cables is developed. The main purpose of this instruction is to provide the correct test procedures, determine the data required to be recorded during the test and integrate the analysis process and decisions on the test results.

Project Goals:

The objective of this project is compilation an executive instruction on MV and HV power cables including list of installation and maintenance tests, list of required tests during the operation (condition monitoring tests), tests procedure, equipment and documentation and analysis method of tests results.

Abstract:

The project has provided a guide for conducting field tests of high and medium voltage power cables. The aging and erosion of cable affected the functional characteristics of the cable formation components the conductor and the insulating system. In order to detect cable destruction, as well as the ensuring the function of the cable system, various tests are made, which is considered as the installation, maintenance and condition monitoring tests of the cable system. The installation tests are performed after installing a cable system and before its energized. So, these kind of tests are applied on new cable and its characteristics are different. Maintenance tests are performed after the cable system repair, and according to which part of the cable repaired and the remaining parts, the separate test should be defined for it. The monitoring of the Kabul status is called tests that will be carried out during the cable operation and periodically, and due to the work of the cable, the test parameters should be made by considering considerations. Hence, in this project, all the requirements and foundations of each category tests are fully addressed and the test parameters are clearly explained. For each test, the generalization, its implementation method and the analysis of the test results are expressed in full potential ambiguities in this regard.

Steps and Methodologies:

The following chapters are presented for this purpose:

Step 1: Investigating the history of subjects of field tests of high voltage and medium voltage of power cable including the review of the documentation of national instructions and international standard institutions and other instructions in other countries, especially areas with similar weather conditions.

Step 2: Compilation of the list of installation, condition monitoring and maintenance tests of high and medium voltage power cables.

Step 3: Definition of executive method of installation, condition monitoring and maintenance tests of high and medium voltage cables and analyzing their results.

Step 4: Compilation of the initial version of the executive instructions of the installation, condition monitoring and maintenance tests of high and medium voltage cables.

Step 5: Developing the final version of the executive guidelines of the installation, condition monitoring and maintenance tests of high and medium voltage cables.

Main Results (technical outputs, patents, papers, books, reports, etc.):

Main findings of this project are:

- Investigation of previous works done worldwide and in country on development of an instruction for field testing of MV and HV cables
- Compilation of list of required tests broken down by installation, maintenance of the cable and during its operation based on valid references and recommendation given by standard committees and technical specification. The tests list is provided considering elite comments and capabilities and limitations faced in country.
- The field testing procedure will be provided according to national and international standards and valid references. Applying the procedures presented in the instructions by the test executors, not only ensures the accuracy of the results and prevents damage to the cable caused by wrong test methods, but also provides the possibility of comparing the results obtained from the various executives. As a result, it is possible to create a database of cable system conditions, even on a nationwide scale, which, in addition to helping to obtain management decisions, will be a valuable database for researchers in the country.

Analysis of results obtained from the tests will be developed in this project. Therefore, an integration in interpretation of tests results among test executors is expected.