



**CIGRE Study Committee B5**

**PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP (1)**

<b>WG* N° B5.64</b>	<b>Name of Convener:</b> Iony Patriota de Siqueira (BR) <b>E-mail addresses:</b> iony@tecnix.com.br
<b>Technical Issues # (2):6</b>	<b>Strategic Directions # (3): 1, 2, 4</b>
<b>The WG applies to distribution networks (4): Yes</b>	
<b>Title of the Group:</b> Methods for Specification of Functional Requirements of Protection, Automation, and Control	
<p><b>Scope, deliverables and proposed time schedule of the Group:</b></p> <p><b>Background:</b></p> <p>Many technologies are available today for implementation of Power System Protection, Automation, and Control (PAC) systems. Most of them use IEC (International Electrotechnical Commission) standards like IEC 61850, IEC 61499, IEC 61131 and IEC 61970. Specialized languages were developed for each of these standards, mostly based in XML (eXtensible Markup Language) or UML (Unified Modeling Language). While bringing productivity, diversity and versatility to the PAC field, these languages are oriented mainly toward specialized design and integration, and for inter-computer communication, but not for non-technical human communication or specification of functional requirements. Several non-standardized graphical tools are available to ease their adoption, but mostly are specific to each technology, standard or proprietary formats.</p> <p>Clearly, there is a need for a discussion about the description of functional requirements from a non-technical user, system or PAC planner point of view, before the decision about its specification and implementation technology, and with focus on the widespread reach and security of the Electricity Supply Systems of the Future. These requirements are currently defined in natural text, subject to the impreciseness and ambiguity of such format. To be precise, there is a need for a human understandable but formal format to force the description of unambiguous requirements, and to allow manual or mechanical compilation into selected technologies by suppliers and integrators. The format will allow also the early application of formal verification and validation methods to such systems, before design decisions are taken, as well as during conformance testing of the final system to the user requirements, and across all stages of the engineering process.</p> <p><b>Scope:</b></p> <p>This Working Group shall survey the currently available methods and formats for specification of functional requirements of PAC systems used by the industry, analyze their advantages and disadvantages, and/or propose new methods for requirement definitions. A questionnaire, under development by TF B5.02, shall be used to collect the utilities, researchers, academia, designers, integrators and suppliers experience and proposals for new methods. A set of examples shall be used in the survey to exemplify the application of the selected methods to typical protection, automation and control configurations of power system substation and their control centers. The automatic or manual compilation of requirements to a target technology will not be addressed, but can be exemplified for demonstration purposes.</p> <p>Based on the results of this survey, the Working Group shall propose the requisites of a</p>	

Domain-Specific Language (DSL) oriented for the specification of functional requirements of PAC solutions for the Electricity Supply Systems of the Future. Using a formal syntax and precise semantics, the language shall help users to describe and exchange the structure and desired logic of PAC systems, without delving into the technological details of its implementation. Complex Temporal Logic (TL) should be possible to be described using simple linguistic constructs near the natural language used by PAC users and planners. A set of examples shall be used in the project to exemplify the language application to typical protection, automation and control configurations of future power system substation and control centers.

**Exclusions:**

The WG shall not elaborate a standard for functional PAC requirements, but propose the requisites of a formal syntax and semantics of a DSL that could be used as input to standardize the format of these requirements. Non-functional requirements and the automatic or manual compilation to target technologies will not be addressed by the Working Group.

**Deliverables:**

- Technical Brochure
- Paper to the Cigre Science & Engineering Journal
- Summary in Electra
- Abstract for Electra
- Tutorial Proposal Forms and Power Point slides

**Time Schedule:** start: January 2017

**Final report:** December 2020

**Approval by Technical Committee Chairman:**

**Date:** 17/01/2017



- (1) Joint Working Group (JWG) - (2) See attached table 1 – (3) See attached table 2  
(4) Delete as appropriate

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

<b>1</b>	Active Distribution Networks resulting in bidirectional flows within distribution level and to the upstream network.
<b>2</b>	The application of advanced metering and resulting massive need for exchange of information.
<b>3</b>	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.
<b>4</b>	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.
<b>5</b>	New concepts for system operation and control to take account of active customer interactions and different generation types.
<b>6</b>	New concepts for protection to respond to the developing grid and different characteristics of generation.
<b>7</b>	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
<b>8</b>	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
<b>9</b>	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.
<b>10</b>	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)**

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