



8 march 2011
Final

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ACTION PLAN 2011 – 2013

of

CIGRE Study Committee B3: "Substations"

1. INTRODUCTION

The purpose of this Action Plan is to describe the technical and administrative activities, that SC B3 intends to lead in period 2011-2013. These activities are in line with the directions defined in the 2005-2014 SC B3 Strategic Plan (Revision 05/11/2009).

2. STRATEGIC DIRECTIONS

Based upon the Changes of the operational environment and upon the ambitions and objectives of Study Committee B3, the following Strategic Directions have been defined :

Strategic Technical Directions

- T1. New substation concepts: Development of new concepts including bus arrangements, hybrid solutions, new applications and functions including specification of corresponding design/layout criteria for substations constituting integral parts of totally optimised networks
- T2. Substation management issues: Organisational aspects including human resource and training needs, in-service support, software management including quality control and maintenance. Asset management including technical, financial and regulatory requirements.
- T3. Life cycle management and maintenance: Monitoring in-service experience including digital and sophisticated measuring equipment, substation condition assessment, aspects of maintenance outsourcing, short-and long-term needs, opportunities for cost reduction, spare parts. Increased utilisation (life extension, upgrading, dynamic loading), refurbishment / renovation concepts, investment strategies, principles for combining existing and new equipment - taking into account specific demands from network-reliability and customer demand-side points of view.
- T4. Impact of new communication standards and Smart Grids on existing and new substations: New technologies to be used in substations, impact of distributed generation and power flow control systems, increased use of advanced information and communication technologies under HV conditions.

The work regarding technical directions should result in publications including guide papers for users covering specification, installation, commissioning, operation, maintenance, life-cycle and ongoing management of substations and their subsystems.

Strategic Administrative Directions

- A1. Organisation of work
The organisation of the Study Committee and its way of working has been adapted to the changing environment, to give increased flexibility and short response time, including the ongoing recruitment of new engineers.
- A2. Co-operation with others
Develop co-operation with other international organisations in the field of substations.
- A 3. Communication

A 3.1 Increased international profile:

Regular publications and contributions to CIGRE Symposia, Paris Sessions, Electra. Strengthen cooperation with CIGRE Regions (presentations during regional conferences); organisation of Colloquia and tutorials in conjunction with Study Committee meetings; organisation of workshops and tutorials in conjunction with WG-meetings.

A 3.2 Internal and external communication:

Improve communication with customers, CIGRE members, non-members and other potential "customers". Improve feedback from the Target Groups and develop communication with decision makers

A 3.3 Tutorials:

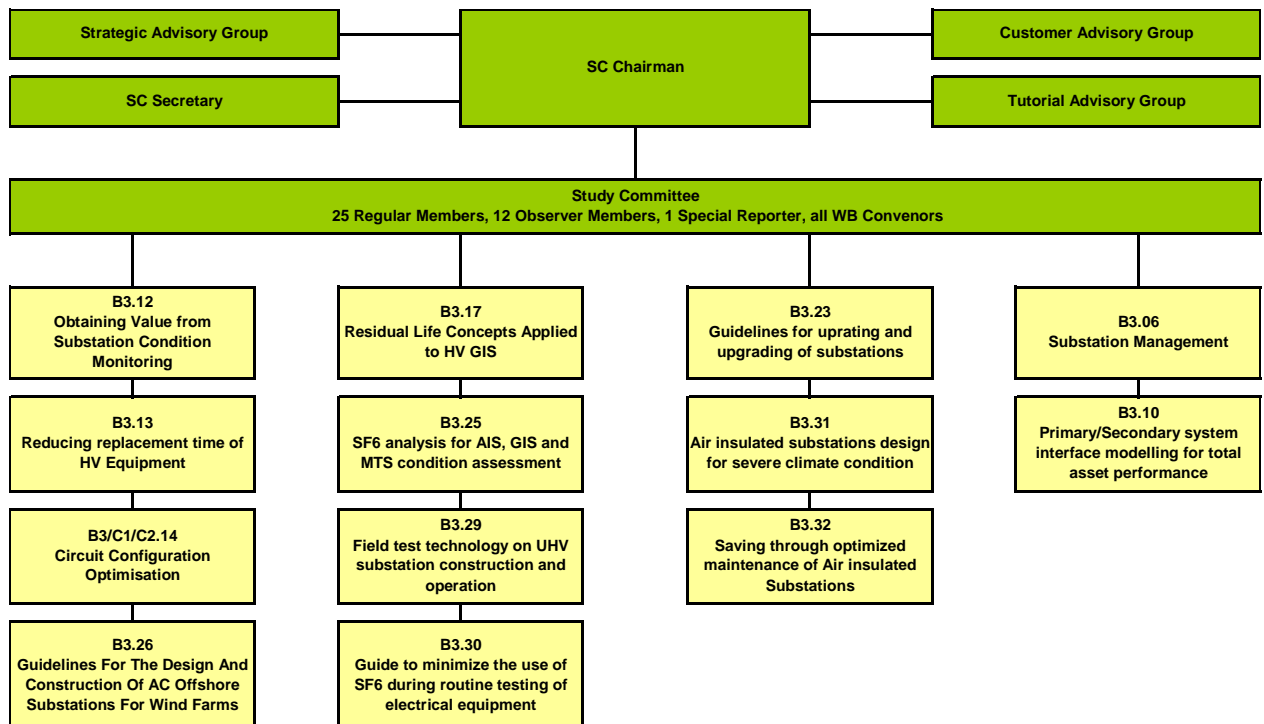
Tutorials will be organised in conjunction with Colloquia, Symposia or other CIGRE events with SC B3 involvement. The content will normally be based on the current or recent activities of Working Groups /Task Forces. Their purpose is to educate/train a range of target audiences (students and young engineers, engineers and managers in the electrical power sector).

New SC B3 Strategic Plan

SC B3 will update its Strategic Plan on the basis of new TC one. The current 2005-2014 SC B3 Strategic Plan (Revision 05/11/2009) will remain the reference till new one has been issued.

3. ORGANISATION

The operational activities are currently carried out by working bodies organised as follows:



Advisory Groups

SAG: Strategic Advisory Group

The objective of the Strategic Advisory Group is to support Study Committee operations. The accountabilities of this advisory group will basically be:

- to ensure an optimal adaptation of the organisation, composition and working procedures of the Study Committee to the changing operating environment
- to develop proposals on strategic, policy and organisational matters
- to suggest contributions/presentations by SC members and working groups for events
- to regularly update the committee's Strategic Plan
- to identify and discuss with stakeholders opportunities for the organisation of colloquia, the participation in CIGRE regional meetings and the co-operation with other international organisations in the field of substations
- to promote the international appearance of the Study Committee in general.
- recruitment of new experts

Designated members of the Strategic Advisory Group are supervising the activities of the following clusters of WGs :

- Substation concepts and developments
- Gas insulated Substations
- Air Insulated Substations
- Substation Management

CAG: Customer Advisory Group

The Study Committee recognises that its success into the future depends on its activities being relevant to the needs and priorities of its target customers, namely the existing and new players in the electric power industry.

The primary task of the Customer Advisory Group is to identify the various categories of customers and their respective needs and priorities, and to ensure that these needs and priorities are addressed in the work of the Study Committee. The needs brought about by market liberalisation, the specific needs of developing countries and newly industrialised countries will all be addressed.

The accountabilities of the Customer Advisory Group are:

- to achieve effective communication with customers
- to identify opportunities to increase customer benefit and satisfaction
- to develop systems and structures to improve customer information and feedback, and support their implementation

to collect relevant feedback from customers and, based on this information, to propose new topics for study.

TAG: Tutorial Advisory Group

According to the Strategic Plan, a Tutorial Advisory Group has been established to advise the SC and its Chairman on the implementation of CIGRE policy in relation to tutorials.

The accountabilities of the Tutorial Advisory Group will basically be:

- to approve the topics and to monitor their content for compliance with CIGRE criteria
- to liaise with other CIGRE SC's for the organisation of joint tutorials
- to monitor the performance of the tutorials

SC B3 Working Groups Clusters

General Accountabilities of Working Group Clusters

SC B3 Working Groups are gathered regarding their main technical topics in WG Clusters. The accountabilities of the WG Clusters will basically be:

- to identify and suggest new work and to prepare terms of reference therefore
- to maintain a high level of know how in their field
- to provide expertise for own work and for participation in joint work
- to evaluate progress of joint work in which the area participates
- to realise the capability for fast response to upcoming questions within their field.

When and where appropriate the WGs should aim at co-operation with other relevant study committees.

Specific Accountabilities of Working Group Clusters

“Substation concepts and Developments”

The Cluster covers the whole substation in a system approach as nodes of optimal power systems. The main directions outlined in the strategic plan should guide the activities of the WGs. The technical, environmental and economical aspects related to substation concepts, should be an integral part of the activities.

Specific subjects of expertise of this cluster include:

- Development of new concepts including novel bus arrangements, mixed substations (hybrid) solutions, applications and functions.
- Considering technical, environmental and economical leading to total optimisation of electric power systems seen as the linkage between generators and consumers including impact of distributed generation, merging of transmission and distribution systems.
- Utilising new technologies and experience, e.g. more compact and multi-functional substations, sophisticated electronic equipment, FACTS, superconductivity etc., to get more overall efficient substation solutions.

“Gas Insulated Substations ”

The Cluster covers all aspects of design, construction, operation, maintenance and life-cycle management of the primary installations of gas insulated substations and gas insulated lines. The main directions outlined in the strategic plan should guide the activities. The environmental and economical aspects should be an integral part of the activities.

“AIS Substations”

The Cluster covers all aspects of design, construction, operation, maintenance and life-cycle management of the primary installations of air insulated substations.

Specific subjects of expertise of this cluster include:

- Design philosophy
- Physical security
- Environmental aspects
- Renewal of existing AIS's
- Management of shared substations
- Mixed technology substations, in cooperation with Gas-insulated Substations
- Commissioning
- Design quality control
- Cost efficiencies of AIS

“Substation management”

This WG Cluster specifically covers all aspects that relate substation performance to system needs as well as all aspects of the secondary installations in substations, with a particular focus on the interface and mutual influence of the secondary installation and the primary equipment.

In this regard all areas related to the organization of the substation asset management process will be investigated. Besides the application and implication of newly adopted management principles like risk management philosophies are subject of discussion. These theories may include approaches to maximize usage of substation assets of which the consequences at life time assessment and system influence will be investigated. The main directions outlined in the strategic plan should guide the activities of this cluster of WGs. The technical, environmental, economical and community acceptance aspects should be an integral part of the activities.

Specific subjects of expertise of this cluster of WGs include:

- Maintenance management theories and organisation
- Reliability/risk management
- Dynamic loading (consequences)
- Replacement management
- Information management
- Engineering expertise of secondary systems, like conventional, digital and hybrid
- Strategic development directions of secondary equipment
- Asset management
- Monitoring from substation management point of view
- Asset health indexing.

4. ACTIVITIES OF THE APPROVED WORKING BODIES

“Substation concepts and Developments”

The following working groups operate in this cluster:

WG B3.12: “Obtaining Value from Substation Condition Monitoring”

This working group shall:

- Identify the condition monitoring devices which are currently available, detail the benefits claimed for these and gather data from Utilities and Solution Providers on their experience to date, probably by a well constructed questionnaire document.
- Identify the factors which need to be considered in answering the question -Will this device be cost effective for my network?
- Attempt to derive an algorithm combining the various factors to assist utilities in making the decision on what aspects of condition monitoring will provide real benefits as opposed to those which simply can be monitored.

WG B3.12 will finalize its deliverables in 2011: An ELECTRA article and a Technical Brochure. It will then be disbanded.

WG B3.13: “Reducing replacement time of HV Equipment”

This working group shall:

- Identify the trends of the replacement policies, taking into account the life cycle of HV equipment presently on the market , skills of the workforce and comparative cost for repair versus replacement
- Identify engineering concepts which may facilitate the replacement in the future
- Identify the present equipment concepts (AIS, GIS, Compact, modules) which will provide the best facilities for complete or partial replacement in the future.
- Identify working methods (for example live working, by-passes..) in order to optimize the outage time and the associated intervention cost.

WG B3.13 will finalize its deliverables in 2011: An ELECTRA article and a Technical Brochure. It will then be disbanded.

JWG B3/C1/C2.14: “Circuit configurations optimization”

The group aims to develop a guideline to support the process of circuit optimization and also to provide a tutorial in existing arrangements taking into account security, availability, accessibility, maintainability and different technologies AIS, GIS, MTS.

So the group shall:

- Analyze and summarize:
 - common circuit configurations and their application
 - Existing successful examples of alternative circuit configuration options
 - Operational reliability and efficiency impacts of new configurations
 - Existing tools for circuit configuration design and availability calculation
- Develop a guideline:
 - Requirements analysis
 - Development of optimized circuit configurations
 - Evaluation of existing and alternative circuit configuration with decision support for the optimal solution
- Application of the guideline and description of examples of circuit configuration optimization.

JWG B3/C1/C2.14 will finalize its deliverables in 2011: An ELECTRA article and a Technical Brochure. It will then be disbanded

WG B3.26: “Guidelines For The Design And Construction Of AC Offshore Substations For Wind Farms”

More and more large wind farms are being located offshore. The aim of the group is to provide some useful guidelines covering all of the aspects which need to be considered in the design, development and construction of these substations. The scope of the Working Group will be limited to AC substations located offshore.

This working group shall:

- Identify the key issues which impact on the design and construction of these substations.
- Provide constructive guidelines to designers, developers and constructors to assist them in addressing these issues in order to develop cost effective practical and sustainable solutions to these challenges.

WG B3.26 will finalize its last deliverables in 2011 (an ELECTRA article issued in December 2010, a Technical Brochure in 2011). The WG will then be disbanded.

“Gas Insulated Substation ”

The following working groups operate in this cluster:

JWG B3/B1.27: “Economical aspects of GIL and underground cables”

The scope of this Joint Working Group is:

- Typical, comparable transmission solutions of GIL and cables are compared
- Technical definitions are given to make the solutions comparable
- Practical applications are chosen

The TOR has not been approved up to now

WG B3.17: “Residual life Concepts applied to HV GIS”

The scope of this Working Group is:

- to identify the factors which determine the expected residual life of HV GIS.
- to present options for maintenance procedures, repair, refurbishment, retrofit or replacement to users so that they can make an assessment of the appropriate approach.

WG B3.17 will finalize its deliverables in 2011: An ELECTRA article and a Technical Brochure. It will then be disbanded.

WG B3.25: “SF6 analysis for AIS, GIS and MTS condition assessment”

High Voltage SF6 switchgear can have a considerably longer life than initially envisaged when the switchgear was produced. Therefore condition assessment of the switchgear become more important. The analysis of the composition of SF6 gas is a very common diagnostic method used for gas insulated equipments. Notwithstanding the considerable amount of analysis of SF6 undertaken the interpretation of the results is not standardized and the recommendations may vary depending on who undertakes the analysis.

The aim of the WG will be to provide the asset manager with the following information:

- When can SF6 analysis be applied most effectively?
- What characteristics of SF6 switchgear can influence the content of SF6 gas?
- What are the most appropriate SF6 substances to analyze?
- What values of individual substances identify an acceptable/deteriorated/post fault condition?
- What are the most appropriate test methods/instruments to use for SF6 analysis?

The results of this work will help the asset manager to optimize the allocation of their Operational Expenditure (OPEX), to prevent major failures, minimize planned outages and thus increase network reliability and availability.

WG B3.29: “Field test technology on UHV substation construction and operation”

Different countries are planning and constructing AC systems with operating voltages around 1100kV or above. Field Tests of substation equipments at a so high voltage level is a very important issue.

The scope of this Working Group is :

- Hand-over test of substation primary and secondary equipments
- Content of commissioning test on UHV substations
- Preventive tests of electrical equipments on UHV substation
- Operation and maintenance tests for UHV electrical equipments

WG B3.29 should finalize its deliverables in 2012 : An ELECTRA article and a Technical Brochure. It will then be disbanded.

WG B3.30: “Guide to minimize the use of SF6 during routine testing of electrical equipment”

Substituting SF6 by another Gas during some routine tests should help reducing SF6 emissions.

The aim of the WG is to:

- Investigate the feasibility of the substitution
- Identify which tests could be modified with which gas
- Define the test procedure modifications
- Evaluate positive or negative aspects of the approach

WG B3.30 should finalize its deliverables in 2013 : An ELECTRA article and a Technical Brochure. It will then be disbanded

“AIS Substations”

The following working groups operate in this cluster:

WG B3.23: “Guidelines for uprating and upgrading of substations”

The objectives of this working group is:

- To review the various practices applied in the utilities regarding the following aspects;
 - Uprating of substation (increasing of one rated value, current, voltage...)
 - Upgrading of substation (changing a substation design feature, busbar scheme...)
- To summarize points to be considered in uprating and upgrading substation at each stage that planning, engineering, basic design, detailed design, project execution, etc.

This Working Group will focus on pointing out the issues related to substation design not only equipment wise and how to deal with them after decision making of uprating and upgrading. The WG will cover all type of substation technologies such as AIS, GIS and MTS.

WG B3.23 should finalize its deliverables in 2012 : An ELECTRA article and a Technical Brochure. It will then be disbanded.

WG B3.31: “Air insulated substations design for severe climate condition”

Numerous substations throughout the world are facing, or will face, various severe climate conditions that require special attention for Air Insulated Substation design.

The scope of this Working Group is :

- A survey of utilities attitudes to climate change
- Utilities practices regarding the design of Air insulated Substations for severe climate conditions Water flooding, Hailstorm...
- To evaluate the effect of these conditions and mitigating measures.
- To research and propose alternatives if available.
- To summarize points to be considered in the design of Air Insulated Substations for severe climate conditions.

WG B3.31 should finalize its deliverables in 2013 : An ELECTRA article and a Technical Brochure. It will then be disbanded.

WG B3.32: “Saving through optimized maintenance of Air insulated Substations”

Utilities and Asset Owners throughout the world are faced with higher requirements for reliability of power delivery and with ageing assets that require increasing maintenance and capital expenditure.

The objective of this Working Group is to review the concepts of sustainment in particular for AIS, applicability to various types of equipment and jurisdictions, methodology of testing, Refurbish versus replacement decisions and optimization of maintenance.

The scope of this Working Group is :

- To review operating and maintenance methodologies for AIS.
- To give guidelines for uniform maintenance standards for various substation equipment.
- To review Guidelines for Refurbish-versus-Replace decisions for AIS.
- To collect experiences from Utilities.

WG B3.32 should propose an interim report and finalize its deliverables in 2014 : An ELECTRA article and a Technical Brochure. It will then be disbanded.

“Substation management”

The following working groups operate in this cluster:

WG B3.06: “Substation Management”

The tasks are covered by two active task forces:

- TF04: substation life assessment replacement philosophies for substation equipment, inventory and interaction of the many different influencing factors to the decision for replacement including risk assessment, flowcharting decision process and case studies providing easy access for practitioners. The working title changed from replacement philosophy into 'Integrated Process for Substation Equipment'
- TF05: practical application of asset management information strategies, finalising previous work on designing an information strategy for asset management risk decisions by reviewing practical experiences with such strategy implementation by utilizing a worldwide questionnaire on the gap between data/asset management tools.

WG B3.10: “Primary/Secondary system interface modelling for total asset performance optimization”

This WG will produce a guide which will help the substation owner / asset manager with the evaluation and selection process of the optimal solution for the substation architecture.

On that purpose it will:

- summarize the reasons for change from conventional to digital secondary systems,
- consider the fast ageing of digital secondary systems compared to primary plant life time, with special emphasis on the conventional interface between the two systems,
- develop new concepts for the interfacing of the two system parts to minimise refurbishment and replacement engineering, installation and site (life) testing,
- study on possible improvements of the reliability of the secondary systems interface to switchgear,
- study on possible improvements of primary equipment utilization and lifetime extension.

WG B3.10 should finalize its deliverables in 2011: An ELECTRA article and a Technical Brochure. It will then be disbanded.

5. DELIVERABLES

Type of Actions are designated as follows:

TR	Terms of Reference
QU	Questionnaire
IR	Intermediate Report to the Study Committee
FR	Final Report to the Study Committee
xP	Paper
xR	Report to be published
xN	Panel Discussion
xO	Event Organisation
ER	Electra Report with quarter when manuscript ready
TB	Technical Brochure with number when issued
PS	Preferential Subject
MT	Monitoring of Trend

where x: C = Colloquium
R = Regional Meeting
S = Session
Y = Symposium

Responsible is designated as follows:

SC	Study Committee
CH	Study Committee Chairman
SM	Study Committee members
WG	Working Group with number
JWG	Joint Working group with number
TF	Task Force with number
JTF	Joint Task Force with number
xAG	Advisory Group (x = C or S or T)
HG	Ad Hoc Group
CO	Central Office

Different background colours are representing different WG Clusters.

Direction	Activity	2011	2012	2013
A1, A4	Prioritising proposals for new work and proposing structures for implementing - Ongoing	SAG	SAG	SAG
A3, A4	Communication with Target Groups – Ongoing	CAG&TAG	CAG&TAG	CAG&TAG
T1, T2, T3	Obtaining value from Condition Monitoring	ER and TB WG B3.12		
T2, T3	Reducing replacement time of HV Equipment	ER and TB WG B3.13		
T1, T3	Circuit configuration optimization	ER and TB JWG B3/C1/C2.14		
T1,T2, T3	Guidelines For The Design And Construction Of AC Offshore Substations For Wind Farms	TB WG B3.26		
T2, T3	Residual life Concepts applied to HV GIS	ER, TB WG B3.17		
T2, T3	SF6 analysis for AIS, GIS and MTS condition assessment		ER, TB WG B3.25	
T2, T3	Field test technology on UHV substation construction and operation		ER, TB WG B3.29	
T2, T3	Guide to minimize the use of SF6 during routine testing of electrical equipment			ER, TB WG B3.30
T2, T3	Guidelines for uprating and upgrading of substations		ER, TB WG B3.23	
T1, T3	Air insulated substations design for severe climate condition			ER, TB WG B3.31
T1, T3	Saving through optimized maintenance of Air insulated Substations		IR WG B3.32	
T2,T3	Integrated Process for Substation Equipment	TB WG B3.06 TF04		
T2, T4	IT strategies for asset management- Survey results	ER WG B3.06 TF05		
T2, T3	General principles for asset management information strategy, incl. applications in practice	TB WG B3.06 TF05		
T2,T3	Aspects for outsourcing of utility services	TB WG B3.06 Former TF01		
T1, T4	Primary/secondary system interface modelling for Total Asset Performance	TB WG B3.10		

Claude Counan
 Franz Besold
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