

**STRATEGIC PLAN
OF STUDY COMMITTEE
A2
Transformers**

(VERSION SEPT. 2007)

1. INTRODUCTION

1.1 Purpose of the Strategic Plan

The purpose of the Strategic Plan is to describe the mid- to long-term ambitions of Study Committee (SC) A2 (Transformers).

It is a necessary tool in the planning of activities and in the build-up and conservation of competency and knowledge within SCA2. This version is a revision of the Strategic Plans of Study Committee 12 (now A2) issued in 1992, 2000 and 2004.

1.2 Time horizon

The Action Plan is the working blueprint of SCA2 covering the specific tasks to be undertaken, whereas the Strategic Plan gives the context and the overall goals.

The Strategic Plan covers the period 2004 – 2010

The Action Plan covers the period 2007 – 2008

1.3 Relationship between SC A2 and Technical Committee strategic plan

The Strategic Plan of the Technical Committee is the basis for individual Strategic Plans made up by the Study Committees. The TC-Plan is in a way a master document where the main operating environment of CIGRE and the Electrical Power Industry is analyzed and related to the Mission of CIGRE. The conclusions arrived at in the TC-Plan impact upon the planning and operation of the SC's.

Each SC must reflect their own views and ambitions in their individual Strategic Plans. In a two-way communication between the TC and the SC's, and in a process of regular interaction, information is fed back and the activities of the different SC's become coherent with the TC-Plan, as well as being adapted to the needs of the CIGRE community.

The mission of SCA2 is defined as:

« To facilitate and promote the interchange of knowledge and information between all countries in the special field of transformer and reactor equipment used in high and medium voltage systems ».

2. ORGANISATION

2.1 Organization and competence of SC A2

SC A2 is mandated by the TC; the Chairman, Regular and Observer Members are appointed by the Administrative Council. SC A2 follows the rules of CIGRE TC.

SC A2 consists at this time of the following experts (see enclosure):

- a Chairman (Member of the TC),
- a Secretary (appointed by the Chairman),
- 24 Regular Members,
- 15 Observer Members,
- 9 conveners of Working Group (WG) (appointed by the Chairman),

- 7 conveners of Advisory Groups to support the SC Chairman in the preparation of the program of actions
- 1 IEC Observer (Chairman of IEC TC14); term of office: whilst IEC TC Chairman
- Liaisons officers with IEEE and IEC TC 10
- liaisons officers to support working actions outside SC A2, mainly in WG D1-01 « Impregnated Solid Material»

The distribution of Members & Experts throughout the Electric Power Industry in 2007 is:

Utilities

- 5 Regular Members
- 7 Observer Members
- 5 Conveners

Manufacturers

- 13 Regular Members
- 5 Observer Members
- 7 Conveners

Third Parties

- 6 Regular Members
- 3 Observer Members
- 4 Conveners

SC A2 meets each even year during the Paris Session and once during the SC A2 Colloquium held in intervening years. SC A2 is highly qualified from a technical standpoint. Regular members, Observer members and Conveners are all experts in their own field of activity with a high level of competence.

2.2 Activities

2.2.1 Scope

The scope of SC A2 covers:

- all kinds of power transformers including industrial, DC converter and phase-shifting transformers
- Reactors, e.g. shunt reactors, series reactors, saturated reactors, smoothing reactors
- Transformer components, e.g. bushings, tap changers, accessories

The activities are related to:

- Design and manufacture
- Application of material
- Utilization, e.g. maintenance and operation, condition monitoring, life management, repair and refurbishment, disposal
- Safety and environmental aspects, e.g. noise, oil spill, fire hazard and explosion
- Economic/commercial aspects
- Quality assurance and testing

2.2.2 Working Group and Task Force Activity

Each WG usually meets at least once per year, with eventually one additional meeting at the time of the SC A2 meeting in Paris or in combination with the SC A2 Colloquium.

Conveners are appointed for the life of the WG. Conveners may appoint Task Force Leaders to manage task forces (TF's) with a limited scope and a shorter life.

Modern communication facilities (e-mail, Internet) are used to make the work of WGs and TF's more effective.

At present 9 working bodies are operating:

- WG A2-24 « Thermal performances of power transformers »
- WG A2-26 « Mechanical condition assessment of transformer windings »
- WG A2-27 « Recommendation for monitoring »
- JWG A2/B4-28 « HVDC Converter Transformer »
- WG A2-30 « Moisture in transformers – Editorial Work »
- WG A2-32 « Copper sulphide in power transformer insulation »
- WG A2-33 « Transformer Fire Safety Practices »
- WG A2-34 « Guide for Transformer Maintenance »
- WG A2-35 « Experiences in service with new liquids »

Experts are nominated by SC A2 as liaison officers with other SC (ex D1-01 in the field of DGA analysis, Dielectric Response, Oil oxidation, etc, or A3-22 in matters related to UHV). A transversal coordination with other SC's is permanently cross-checked through a new specific AG (see 4.1.3).

2.3 Strength/weakness factors

The strength of SCA2 stems from the following factors:

- A permanent structure that allows a multiplicity of interlocking areas of technology to be examined concurrently and/or in sequence.
- A high level of knowledge available through individual members, who interact informally and support an effective network of experts.
- A satisfactory mix of experts from the utility and manufacturer side backed up by independent consultants/representatives of scientific institutes.
- An increasing number of experts from new industrializing/developing countries due to the opening of the Study Committee to Observer Members.
- An increasing participation of younger engineers in the SC A2 activities.
- A wide international interface to other organizations working in the same area of interest.

The weakness of SC A2 relates to:

- Still too few developing countries involved in the current SC activities.
- Slow progress of work due to limited time available for CIGRE activities and the cost implications for sponsoring organizations.
- A limited resource of experts limiting the amount of project work that can be effectively undertaken.
- In relation with SC A2 activities, NC shall be more active by proposing local activities and helping the dissemination of SC A2 works

Relevant actions are needed to improve SC A2 performances.

3. RELATION WITH EXTERNAL ORGANISATION

3.1 Evolution of Electric Power Systems

In the past the activity of SC A2 was mainly focused on transformer technology. The „customers" were more or less exclusively utilities and manufacturers. Interaction with other equipment in the system was of minor interest. Since the first Strategic Plan was issued the environment of CIGRE and of the SC has changed substantially. The number of players in the energy supply market has increased. On the „customer" side economical considerations are dominating and technical expertise is decreasing. On the other hand the demand of high qualified technical support and advice is increasing.

3.1.1 Customers of SC A2

With deregulation of the energy supply market and unbundling of large utilities the number of possible customers of CIGRE and SC A2 has increased:

- Utilities
- Manufacturers
- IPPs (Independent Power Producers)
- ISOs (Independent System Operators)
- Industrial consumers
- Asset Managers
- Consultants
- Contractors
- Regulators
- Universities/Institutes
- Service companies
- Investors, Shareholders

Most of them are less technologically oriented and therefore will request high standard technical support.

3.1.2 Environmental Factors

- The forthcoming legislation of EMC concerning power system equipment.
- An increasing awareness of the problems caused by industrial noise.
- Problems due to mineral oil spillage into the environment.
- Safety aspects related to explosion and fire hazard in case of equipment faults.
- Energy conservation policies pursued by utilities.
- Increasing density of energy supplies in highly populated areas.

3.1.3 Changing Customer Base

- The formation of larger electric power networks and the ramification of Third Party Access policies.
- The shift of priorities from technology towards economics of energy trading.
- The emergence of new trading blocks.
- Mergers of manufacturers.
- The trend towards decentralized power generation.
- FACTS and the use of power electronics to control the power flow and to increase the load in networks.
- Improved and condition based maintenance practices.
- Repair and life-extension policies.
- Requirements for shorter pay-back periods of equipment.

- Tighter financial constraints.
- Reduced human resources in the field of technical expertise and competence.

3.2 Projected impact on SC A2 activities

The driving factors listed in 3.1 result in the following impact on SC A2:

- Decisions to replace or repair will be based on different criteria in the future.
- The requirement of optimum financing conditions will request reduced manufacturing times of equipment (last minute ordering).
- Reliability issues and cost implications will assume greater prominence.
- Life-cycle costs including maintenance costs will become more important.
- Specifications for equipment from different purchasers will be modified towards a common format based on functions instead on predetermined technical solutions.
- Product safety assurance requirements will become more visible.
- The demand for qualified technical assistance and support will increase.
- The need to convince the diverse range of customers of CIGRE's relevance to their business.

3.3 Evolution of Other Organizations

The key organizations which have an impact on SC A2 and with whom SC A2 must have more effective interfaces are:

- IEC
- CIRED
- IEEE

SC A2 is represented in these organizations by Members or Observers, who regularly report on the status of activities during the annual SC meeting. In particular the relationship to IEC is close, since the chairman of IEC TC14 is linked as liaison officer with SCA2. Collaboration with EPRI and IEEE also is very close because of the presence of an US delegate in the SC.

4. AMBITIONS AND GOALS FOR SC A2

Responding to the changes in the Electric Power Industry SC A2 pursues mainly two strategic directions (SD) based on the needs and requirements of their customers.

The first addresses business and commercial considerations and concerns and is labeled „Services to Customers", while the second is related to „Technology Issues".

The preparation and publication of guides to conserve the existing know-how will form an important activity in future work programs.

Concerning the administration of planned activities the Study Committee will take appropriate steps to improve the effectiveness of work, e.g. segmentation of work to smaller tasks, which can be handled by individuals or small Task Forces within short time, and by the use of modern communication systems (e-mail, Internet).

The relation with other SC's will be reinforced due to the creation of a new AG (see 4.1.3).

4.1 Strategic Directions

An AG « Strategic » (SAG) is supporting the SC Chairman in the updating and revising of strategic plan and in the decision process taking in account the input from the CAG (see 4.1.3). All WG and AG conveners are part of the SAG.

4.1.1 SD1 - Services to Customers

All relevant aspects to that SD will be coordinate by the AG « Transformer Users » and AG « Customers »

- Reliability and availability information on transformers and reactors in service determined by surveys of equipment performance on an inter-national basis with periodical up-dating.
- Impact of accessories on transformer reliability, e.g. terminals, bushings, tap-changers and cooling equipment.
- Influence of contamination in oil on transformer reliability.
- Life management of transformers and reactors, e.g. :
 - Maintenance philosophies and practices
 - Management of monitoring and diagnostic methods
 - Installation procedures, oil treatment, on-site drying, on-site testing
 - Determination of remaining life
 - Decisions to repair (on-site or in factory) or to scrap
 - Failure codes
 - Guide for failure investigations
 - Preservation of oil systems
 - Types of oil available, use of inhibitors and additives, reclaiming of oil
 - Disposal of worn out material, e.g. oil
 - Environmental Aspects
- Economical issues, e.g. first cost versus total costs of ownership, models for cost evaluation

4.1.2 SD2 - Technology Issues

All relevant aspects to that SD will be coordinate by the AG « Transformer Technology »

- Application of new materials, e.g. substitutes for mineral oil (with SC D1 participation), amorphous steel, new insulation materials, hybrid systems, etc.
- Safety issues for transformers, e.g. tank rupture, fire hazard, explosion of bushings
- Electromagnetic compatibility measurements and limits
- New technologies for design, manufacture and testing
- New concepts, e.g.
 - FACTS and the application of power electronics, e.g. electronic
 - tap changers for phase-shifting transformers
 - Superconducting transformers and current limiters
 - Site assembled transformers
- Analysis of electric, magnetic and thermal fields: modeling and validation through benchmarking, etc
- Electrical environment of transformers, e.g. service under different climatic conditions, interaction with the system,
- Pre-standardization work (on the request IEC TC14), e.g. short circuit performance, application of digital test procedures and equipment (with relevant other CIGRE SC's)

4.1.3 Advisory Group

In addition to the three AG's (Strategic, Technology, Users) mentioned before, four additional AG's have the tasks to support the SC Chairman in the preparation of the program of actions.

- AG «Tutorial »: to produce guideline for tutorials, coordination of the presentation of tutorial and preparation of new tutorials.
- AG «Customer » : to obtain key information that need addressing by SC and to provide input to WG's
- AG « Survey of transversal CIGRE activities»: to propose new work actions or liaison depending of activities in the field of transformers within other SC.
- AG « UHV AC & DC Transformers»: to propose new work actions or liaison in relation with the development of UHV activities within IEC and/or CIGRE.

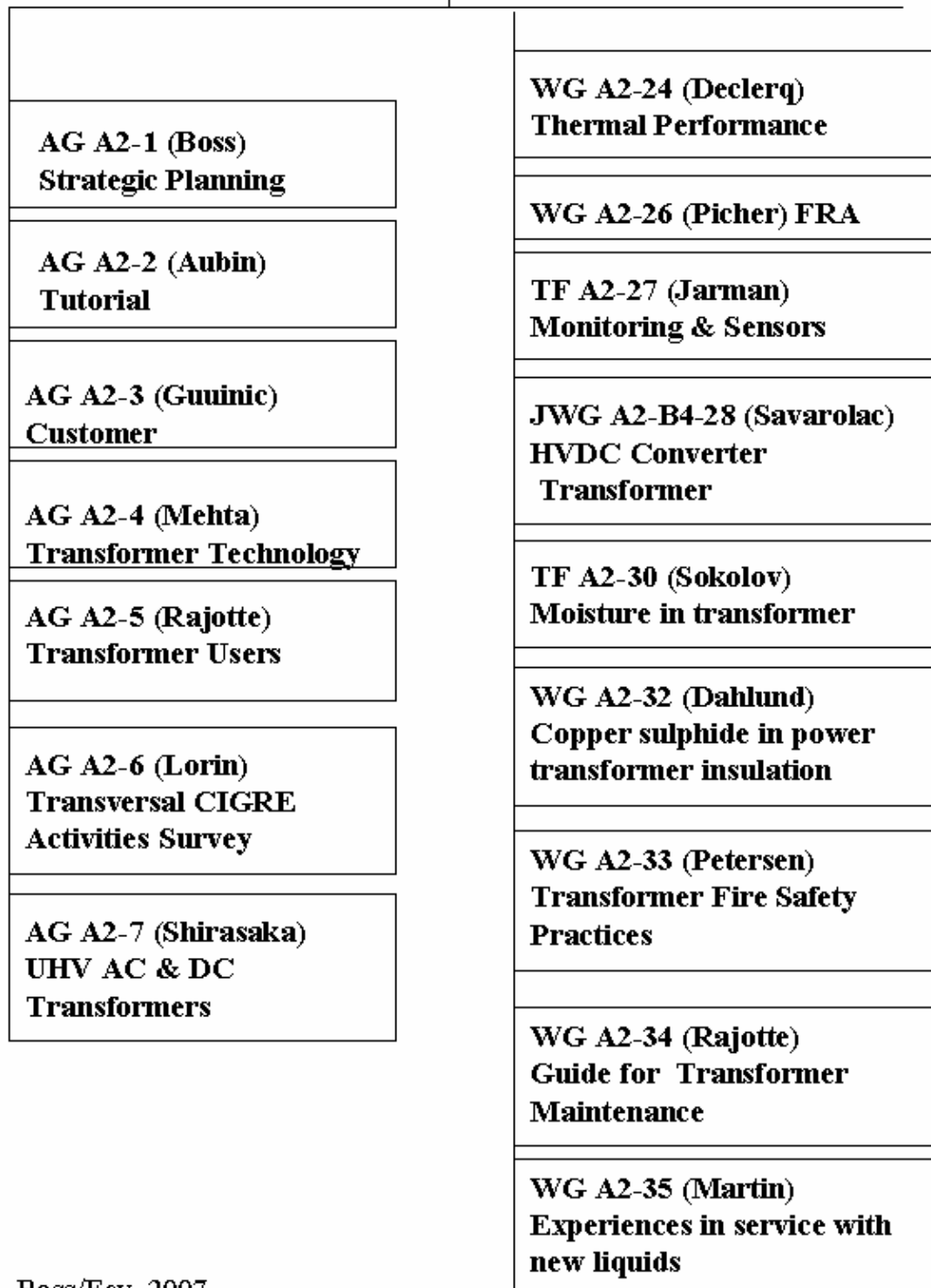
4.2 Administrative Goals

A major improvement is linked with closer communication by extensive use of e-mail and Internet, which to some extent will replace meetings of WGs or TF's. Savings in cost and time will be beneficial for the progress of work.

In order to successfully run the activities it is necessary to:

- involve more experts from industrializing/developing countries
- improve the collaboration with NCs
- improve the collaboration with other SC's. Potential collaboration with A3 (control switching, surge arresters), B2 (dynamic loading, phase shifter), B3 (reliability), B4 (HVDC), B5 (digital protection), C1 (economic, asset management), C2 (dynamic loading), C3 (environment), C4 (insulation coordination), C6 (CIRED), D1 (material), D2 (data management).
- better involve the „customers" in the planning process for activities and preferential subjects
- present the mission, the organization and the on-going activities of SC A2 to the public (home page in the Internet)
- Tutorials on selected technical items in combination with Regional Meetings or Symposia and dissemination of activities shall have priority
- All SC members have to be involved in the current activities

Enclosure

SC A2**Chairman : Boss / Secretary : Rajotte**

P. Boss/Fev. 2007