



CONSEIL INTERNATIONAL DES GRANDS RÉSEAUX ELECTRIQUES

INTERNATIONAL COUNCIL ON LARGE ELECTRIC SYSTEMS

**COMITE D'ETUDES
A1
STUDY COMMITTEE**

**Machines Tournantes
Rotating Machines**

ACTION PLAN

OF

STUDY COMMITTEE A1

ROTATING ELECTRICAL MACHINES

2009 - 2011

(VERSION 2 - AUGUST 2009)

ACTION PLAN
OF
STUDY COMMITTEE A1
ELECTRICAL ROTATING MACHINES
2009 – 2011

1. INTRODUCTION

The purpose of this Action Plan is to describe the technical and administrative activities that SC A1 intends to lead in period 2009-2011. These activities are in line with the directions defined in the 2009 – 2019 Strategic Plan of the Study Committee. If necessary this Action Plan will be updated during its validity period.

2. STRATEGIC DIRECTIONS

Based on the changes of the operational and business environments and on the ambitions and objectives of Study Committee A1, the following Strategic Directions have been defined:

2.1. STRATEGIC TECHNICAL DIRECTIONS:

Within its field of activity study committee A1 shall:

⇒ Serve all its customers involved in the process of generating electrical energy by means of:

- Providing a forum where suppliers and users can share and exchange experiences and information
- Being aware of customers needs
- Monitoring and reporting on the international development
- Promoting trends beneficial for its customers
- Issuing guidelines and recommendations
- Updating former reports due to recent developments in design, materials, insulation, cooling and bearings technology and improvements in efficiency and maintenance.

⇒ Promote innovative solutions and concepts considering all relevant factors (economical, technical, environmental and others)

⇒ Be aware of the needs of the developing countries, actively work in order to fulfill them and involve representatives for these countries in its work

⇒ Actively promote and support international co-operation and conferences

⇒ Promote Symposium/Colloquium during Study Committee Meetings in odd years

⇒ Participate in Regional Meetings with technical contributions

2.2. STRATEGIC ADMINISTRATIVE DIRECTIONS

2.2.1. Organization of work

Focus will be placed on shorter turn-around time of existing projects in the working groups and task forces in order to comply, as much as possible, with the duration of three years or less established by CIGRE to carry out the works, as well to produce relevant documents for publication. Initially the committee needs to complete existing tasks, however new WGs/TFs may be created to assume new works, but without exceeding the “firepower” of the SC.

The organization of the study committee and its way of working shall be adapted to the changing operating environment, aiming at increased flexibility and short response time. The use of e-mail system, the web and setting milestones between meetings will be used to speed up the work output.

2.2.2. Co-operation with others

Establish a more extensive co-operation within CIGRE, in particular with the System Study Committees. Improve co-operation with other international organizations in the field, particularly with the standardization organizations.

2.2.3. Use of internet

Encourage the use of internet applications.

2.2.4. Tutorials

Disseminate technical knowledge by means of Tutorials

2.2.5. Young experts

Promote the recruitment of young experts and their inclusion in the activities of the Committee.

3. ACTIVITIES OF THE APPROVED WORKING BODIES

3.1. AG A1.01: TURBOGENERATORS

The following working groups operate under the advisory of AG A1.01:

3.1.1. Scope and objectives

WG A1.01: Guide on Overfluxing Generators

This working group has the task of investigating the incidents where generators have failed catastrophically due to over fluxing, study the behavior of the flux in the generator when excitation is turned on (fast ramp and slow ramp) and recommended a solution to avoid this problem.

WG A1.03: Guide on Generator/Power System Inter relationship Issues

This working group shall: Research grid code practices, OEM and utility concerns on the issues of grid interface. Discrepancies between IEC standards, USA standards and real problems OEM and users have with the above will be investigated and highlighted. This work will be coordinated with the other relevant CIGRE committees.

WG A1.05: Economic Evaluation of Generator Refurbishment / Replacement

This working group shall provide a Guide for Economic Evaluation of Refurbishment/Replacement decisions on generator systems and related power plant equipment. Describe the influence of condition based monitoring, inspection, inspection, operating history as inputs to the decision process. Discuss the methodology of estimating the risk of each potential course of action.

WG A1.11: Guide for On-Line Monitoring of Electrical Generators

This working group has the objective to make an assessment of the stage and the future development of the on-line condition monitoring tools for large generators.

WG A1.15: Guide on Stator Water Chemistry Management

This working group will analyze the problem which can be caused by the cooling water in stator winding due to its circulation through hollow conductors made of copper in order to avoid the plugging of these hollow conductors by oxide deposition. It appears that water chemistry management is very important to prevent plugging and stator cooling deterioration. Several ways of eliminating plugging root causes are available, depending on manufacturers or utilities.

WG A1.16: Guide on Generator Coil Retaining Ring - a System Survey and General Guideline

This working group has the objective to investigate the problem of stress corrosion cracking on the coil retaining ring of large turbo-generators and make recommendations to avoid this problem.

3.1.2. Action Plan: Present status of the activities

Advisory Convener: Robert Fenton (US)

Working Group	Title	Name of Convener	STATUS	Ready for Publication
A1.01	Guide on Over fluxing Generators	Neil Connolly (UK)	1. Terms of Reference (TOR) issued for Approval by 15 November 2007. 2. Draft version 1 issued by 15 January 2008. 3. Comments on version 1 by 30 April 2008. 4. Neil Connolly (UK) published a revision 1 draft 15 July 2008 5. Comments on Revision 0 by 15 November 2008. 6. Revision 2 issued by 31 May 2009 7. Comments by 31 July 2009 8. Revision 3 by 31 August 2009 9. Discussion and final approval at 2009 meeting in Australia 10. Final report in 2010	2011

			11. A training program will be developed once the work is complete	
A1.03	Guide on Generator/Power System Inter relationship Issues	Gert Coetzee (RSA)	1.Terms of Reference (TOR) issued for approval by 31 December 2007. Approved 2.Scope issued for approval by 31 December 2007. 3.Define team members and assign responsibilities by 31 May 2009 4.Revision 0 of at least 3 chapters by 30 August 2009 5.Outline of other chapters by 30 August 2009 6.Discussion of chapters drafted, the outline of the other chapters and establishing an ongoing schedule at the 2009 meeting in Australia 7.Revision 1 to original chapters by 30 November 2009	2012
A1.05	Economic Evaluation of Generator Refurbishment / Replacement	S. Salem (US)	1.Sam to assign detailed tasks to team members by 31 December 2008 2.Draft Revision 1 to A1.01 members by 31 July 2009. 3.Discussion at the September 2009 meeting in Australia 4.Comments by 30 October 2009. 5.Draft Revision 2 by 31 January 2010 6.Comments by 31 May 2010 7.Draft Revision 3 by 31 July 2010. 8.Final approval at 2010 meeting 9.An SC-A1 panel session should be considered for this topic 10.A Tutorial will be developed once the work is complete	2011
A1.07	Generator Maintenance, Inspection and Test Programs	John Linton (AU)	Work completed Disbanded Ready for publication.	2009
A1.09	Guide for Minimizing the Damage from Stator Winding Grounds on Turbo-generators	Oscar Martinez (Spain)	This Guide is complete and ready for publishing. The Working Group is disbanded with thanks.	2009
A1.11	Guide for on-Line Monitoring of Electrical Generators	Dan Zlatanovic Romania/ Robert Fenton (US)	1.Revised list of sensors by Mr Weidner by 01 December 2007. 2.Draft Technical Report by Mr. Fenton by January 15, 2008. 3.Comments to draft report by 30 April 2008. 4.Final Draft Report by 15 July 2008 for discussion and Approval at 2008 meeting. 5.Final approval by AG A1.01 and SC-A1 at 2008 meeting. This approval occurred under the 6 weeks rule with minor comments. Mr. Fenton to issue the final version incorporating comments by 30 April 2009. 6.A Tutorial will be developed once the work is complete	2009
A1.15	Guide on Stator Water Chemistry Management	F Duffeau (Fr) R Svobda (CH)	It was believe that this work was complete. However, Germany, later joined by other countries, voiced an objection. Mr Svoboda (CH) has agreed to take on a revision incorporating comments from other National Members. The proposed schedule is: 1. Revised Draft by 31 May 2009. 2. Comments by 31 July 2009. 3. Discussion in Australia 21 September 2009. 4. Follow up revision during 2010 5. Acceptance as final at Paris in 2010 6. Ready for publication in 2011	2011
A1.16	Guide on Generator Coil Retaining Ring - A System Survey and General Guideline	G Coetzee (RSA)	This work was viewed as complete when Germany raised some objections. The work will be revised with minor changes. The proposed schedule is: 1.Document changes from Germany by 30 April 2009. 2.Final Revision issued by 30 June 2009. 3.Discussion and acceptance in Australia 21 September 2009. 4.Finalized in CIGRE format early in 2010	2010

3.2. AG A1.02: HYDROGENERATORS

3.2.1. Scope and objectives

The following working groups operate under the advisory of AG A1.02:

WG A1.02: Generator Stator Winding Stress Grading Coating Problem

This working group task will be to gather the knowledge of technical people concerning the stress grading coating problem and to have an idea of the degradation of world hydro generators fleets. A survey to improve the future technical specifications will therefore be sent all over the world.

WG A1.04: Generator Fire Protection Guidelines

This working group task will be to update a former survey adding the actualized different stand points of the groups described below and to convey them to one document that will help generators to be designed with provisions to receive fire protection equipment that will be functional, environmentally sound, comply with the applicable standards, to attend the insurance companies requirements – resulting insurance costs reductions, and on the top of that giving to the owners the best possible result in case of a fire.

Groups: Generators users; Generators Manufacturers; Insurance companies and insurance brokers; Erection, commissioning, refurbishment and maintenance companies and Research Centers and Universities.

WG A1.12: State of the Art of the Efficiency in HydroGenerators Commissioned in the Last 10 years

This working group task will be collect information about efficiency and losses obtained from tests of units commissioned in the last 10 years in order to produce a statistic base. This base processed will allow to obtain the expectable efficiency for a new hydro generator as a function of its capacity and speed.

WG A1.13: Feasibility of Updating from Class F to Class H the Insulation Systems in Electrical Rotating Machines

Explore the possibility of updating the insulation systems used in rotating electrical machines by replacing class F by class H, retaining the performance and the reliability of the machines. We shall take into account two different points of view: the OEM's (Original Equipment Manufactures) and the User's point of view. The manufacturers invest a lot of money in R&D and every year develop new materials and applications. However sometimes it takes a long time for those to reach the market. Both OEMs and Users have little interest in being related to the failure of a new development or technology.

WG A1.14: Guide for Minimizing the Damage from Stator Winding Ground Faults in Hydrogenerators

Stator earth faults are the most common fault in generators, produced by the breakdown of the machine winding insulation to earth through the core of the stator. Some factors, such the method of grounding used, and de-excitation systems, will determine the damage to the stator core and to the stator windings. The meaning of earthing methods is to prevent severe damage to the core and conductor of the stator, reducing stator earth fault current as much as possible. The goal of this working group is to assess the stage and to review the stator winding grounding criteria.

3.2.2. Action Plan: Present status of the activities

Advisory Convener: Remi Tremblay (CA)

Working Group	Title	Name of Convener	STATUS	Ready for Publication
A1.02	Generator Stator Winding Stress Grading Coating Problem	Remi Tremblay (CA)	1.Terms of Reference (TOR) approved by April 2008 2.Final questionnaire sent on September 18 th 2008. 3.Draft of the report to be submitted by September 4 th 2009-09-04 4.Final report to be presented by August 2010 5.A Tutorial will be developed once the work is complete	2011
A1.04	Generator Fire Protection	Alexander Gromow (BR)	1.Terms of Reference (TOR) approved on April 2008. However, this WG began his activities at the end of 2005 2. Comparison between similar questions from the Groups 1, 2 and 6:ready. Presented at the Paris Biannual Session in 2008 – 40 pages (465 survey items) 3. Isolated analysis of Group-01 – Users: ready. Presented at SC-A1 Sydney Meeting in 2009 – 174 pages (3640 items). 4.Draft report to be issued by April 2010 5.Final report for Paris 2011. 6.Technical Brochure forecasted by April 2011	2011
A1.06	Intermittent Operation – Experience with Hydro-Generators	L.E. Kampe (SE)	Work completed Disbanded Ready for publication.	2009
A1.10	Survey of Hydro-Generator Failures	J.L.Garcia Araco (SP)	Work completed Disbanded Ready for publication.	2009
A1.12	State of the Art of the Efficiency in Hydro-generators Commissioned in the Last 10 years	H.D.Pires (AR)	1. Terms of Reference (TOR) Approved by December 2008 2.Draft of questionnaire version 1 issued by March of 2009 3.Comments on version 1 in progress 4.Definitive version questionnaire to be submitted by 24/4/09 5.Data processing in 2009 and 2010 6. Draft report in 2010 7. Final report by January 2011	2011
A1.13	Feasibility of Updating from Class F to Class H the Insulation Systems in Electrical Rotating Machinery	J.L.Garcia Araco (SP)	1.Terms of Reference (TOR) approved by 15 October 2008 2. Questionnaire for comments scheduled for June 2009 3.Questionnaire for comments scheduled for discussion and approval at 2009 Sydney meeting 4.Draft report in 2010 5.Final report in 2011 6.A Tutorial will be developed once the work is complete	2011
A1.14	Guide for Minimizing the Damage from Stator Winding Grounds on Faults in Hydro-Generators	Oscar Martinez (SP)	1.Terms of Reference (TOR) approved on 16 October 2008 2. Draft Report 1: 15 February 2010 3.Commented version: August 2010 Paris Session 4.Final Report: 2011 meeting 5. Ready to be published: February 2012 6. Tutorial ready: July 2012	2011

3.3. AG A1.05: NEW TECHNOLOGIES

3.3.1. Scope and objectives

The following task force operates under the advisory of AG A1.05:

TF A1.20: Establish the Background and Scope for New Working Groups on Wind Generation

This task force shall identify main interests of wind generator manufacturers and wind

generation utilities in regards to wind generator design trends, design issues, maintenance, operation, and monitoring and diagnostics. Prioritize issues based on significance to generator manufacturers and turbine users. Define study scope, deliverables, and timeline for the top 2 issues identified in the previous step to form working groups.

3.3.2. Action Plan: Present status of the activities

Advisory Convener: Sameh Salem (US)

Task Force	Title	Name of Convener	STATUS	Ready for Publication
A1.20	Establish the Background and Scope for New Working Groups on Wind Power Generation	S. Salem (US)	1. Identify main interests of wind generator manufacturers and wind generation utilities in regards to wind generator design trends, design issues, maintenance, operation, and monitoring and diagnostics. 2. Prioritize issues based on significance to generator manufacturers and turbine users. 3. Define study scope, deliverables, and timeline for the top 2 issues identified in the previous step to form working groups. 4. Deliverables: Report presented to SC A1 in September 2009 in Australia.	2009

3.4. AG A1.06: LARGE MOTORS

3.4.1. SCOPE AND OBJECTIVES

The following working groups operate under the advisory of AG A1.06:

WG A1.08: Power Station Large Motors Requirements in the Field of Standards

The working group shall prepare a questionnaire aimed at establishing if present standards are good enough in case of large motors supply. In case of negative answers suggestions are required about the more critical areas and topics in order to push competent bodies to revise and/or complete the existing standards.

WG A.17: Methods of Determining the Condition of Stator Winding Insulation and their Effectiveness

This working group shall perform a guide which covers: a brief manufacturing process theory explanation; the stator winding insulation typical defects; the insulation testing techniques theory, such as the Measurement theory, the in situ testing methodology, the diagnosis theory and the effectiveness of each technique.

WG A1.18: Extending Life of Large Motors in Nuclear Power Plants

This working group shall present a brief explanation of relevant manufacturing technologies; the list of major defects; the list of stator winding insulation typical defects; the effectiveness and limits of main investigating techniques; the possibility of correlating different parameters in order to obtain a reliable estimation of remaining life of motors, as well the possibilities and means for extending life of existing motors.

WG A1.19: Motor Failure Survey

The most important power plant equipment, mostly driven by large capacity high voltage electric motors, poses the risk of unscheduled shutdowns because of motor failures, and high generation losses as a consequence. It is important to understand whether can be found some correlation between work conditions, load of motors, start-stop frequency, maintenance policy or other factors and large capacity HV motors failure. Based on responses to a questionnaire, statistics will be done by the working group in order to provide proper data analyses and obtain conclusions and make recommendations.

3.4.2. Action Plan: Present status of the activities

Advisory Convener: Enzo Tortello (IT)

Working Group	Title	Name of Convener	STATUS	Ready for Publication
A1.08	Power Station Large Motors Requirements in the Field of Standards	E. Tortello (IT)	<ol style="list-style-type: none"> 1. TOR approved the 11/12/2008 2. Questionnaire distributed at the same time 3. Answers collected from 10 countries (one country sent multiple answers) by the end of February 2009 4. Last call for answers al the end of March 2009 5. Starting elaboration of the report at the end of May 2009 6. Final report by middle of September 2009 	2009
A1.17	Methods of Determining the Condition of Stator Winding Insulation and their Effectiveness	S.D. Ruiz (SP)	<ol style="list-style-type: none"> 1. TOR approved the 11/12/2008 2. Scheme of the guide and summary of each chapter by the end of April (4 month delay) 3. Draft report in 2009 4. Final report in 2010 	2010
A1.18	Extending Life of Large Motors in Nuclear Power Plants	M. R. Siniscalchi (BR)	<ol style="list-style-type: none"> 1. TOR approved the 12/01/2009 2. Draft questionnaire circulated in the middle of January 3. 2nd draft circulated in the middle of February 4. Additional comments received at the end of February to be incorporated 5. Middle of March final version of the questionnaire 6. Draft report in 2009 7. Final report by December 2010 	2010
A1.19	Motor Failure Survey	V.Skundric (RS)	<ol style="list-style-type: none"> 1. TOR approved the 11/12/2008 2. Questionnaire circulated by the end of January 2009 4. Draft report in 2009 5. Final report by December 2010 	2010

4. ACTION PLAN: DELIVERABLES

The table below shows the schedules foreseen for the deliverables of the working groups and task forces in the period 2009 – 2011.

Note that we have also indicated for each WG and TF the years for publishing the documents produced. As we do not have the most part of the documents finished, even in a preliminary version, it may be possible that some documents classified as to be published as Reports in Electra or as Technical Brochures with an executive summary in Electra or as Reports on the SC A1 website may have another classification when they begin to receive contributions from our members and experts when we could have a better estimative of their dimensions. Nevertheless, we feel that this may not happen quite frequently so that we tried to exercise our best judgment in establishing the present classification considering the ToRs and the status of the works.

Type of Actions are designated as follows:

- QU Questionnaire
- IR Intermediate Report to the Study Committee
- DR Draft report
- DRx Draft report version x, where x = 1,2,3,etc...
- FR Final Report to the Study Committee
- RE Report ready to be published in Electra
- RW Report ready to be published on the SC website
- TB Technical Brochure ready to be published with an Executive Summary in Electra
- TU Tutorial

ACTION PLAN: DELIVERABLES OF THE WORKING GROUPS AND TASK FORCES IN THE PERIOD 2009 – 2011					
AG	WG/TF	Scope of work	2009	2010	2011
A1.01	WG A1.01	Guideline	DR	FR	RE, TU
	WG A1.03	Guideline	DR1	DR2	DR3 TB > 2011
	WG A1.05	Guideline	DR1	DR2,DR3,FR	TB, TU
	WG A1.11	Condition assessment	FR, TB, TU		
	WG A1.15	Guideline	DR1	DR2, FR	RE or TB
	WG A1.16	Guideline	FR	TB	
A1.02	WG A1.02	Experience update	DR	FR	TB, TU
	WG A1.04	Experience update	DR1	DR2, FR, TB	
	WG A1.12	Field experience	QU	DR	FR, RE or TB
	WG A1.13	Experience, trends	QU	DR	FR, RE or TB, TU
	WG A1.14	Guideline	DR	FR	TB, TU
A1.05	TF A1.20	Set up of new WGs	RW		
A1.06	WG A1.08	Recommendations for Standards	QU, RE or RW		
	WG A1.17	Experience, trends	DR	FR, RE or TB	
	WG A1.18	Experience	QU,DR,FR	RE or TB	
	WG A1.19	Experience	QU,DR, FR	RE or TB	

The following documents were already finished and are waiting for publication by the Central Office:

WG	Title	Type
A1.06	Intermittent Operation – Experience with Hydrogenerators	RE
A1.07	Generator maintenance, inspection and test programs	TB
A1.09	Guide for minimizing the damage from stator winding grounds on turbogenerators	TB
A1.10	Survey of hydrogenerator failures	TB

The following documents were published on SC-A1 website:

AG	Title	Type
A1.06	Perception of Large Motors	RW
A1.06	Motors for Nuclear Power Stations	RW

TOTAL OF DELIVERABLES: 2009 - 2011				
Publication	Year			TOTAL
	2009	2010	2011	
TB	4 (*)	2	3	9 (*)
RE	1 (**)	-----	1	2 (**)
TB or RE	-----	3	3	6
RW	3(***)	-----	-----	1
RE or RW	1	-----	-----	1
TOTAL	7	5	7	19

(*) – Three TBs already sent for publication (**) – Report already sent for publication
 (***) Two Reports published on SC-A1 website

5. PROGRAM FOR SESSIONS, MEETINGS, AND COLLOQUIA

Event	2009	2010	2011
SC Meeting and Colloquium	Sidney, Australia Sept. 20 -25		China
SC Session		Paris, France August 22-27	
Regional Meetings	ERIAC, Argentina May 24 -28		ERIAC, Paraguai

Updated: August 31, 2009

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