



# **CIGRE STUDY COMMITTEE B2: "OVERHEAD LINES" STRATEGIC PLAN 2008-2017**

**CHAIRMAN : BERNARD DALLE**  
RTE  
1 TERRASSE BELLINI - TSA 41000  
E'mail: [bernard.dalle@rte-france.com](mailto:bernard.dalle@rte-france.com)  
92919 LA DEFENSE CEDEX  
FRANCE

TEL : 33 1 41 02 10 43  
MOB : 33 6 60 32 97 74  
FAX : 33 1 41 02 22 11

**SECRETARY : NORMAND BELL**  
HYDRO QUEBEC  
E'mail: [bell.normand@hydro.qc.ca](mailto:bell.normand@hydro.qc.ca)  
855, Ste Catherine Est 16 th Floor  
MONTREAL H2L 4P5  
CANADA

TEL : 1 514 840 3000-3589  
FAX : 1 514 840-4211



<b>1</b>	<b>INTRODUCTION.....</b>	<b>3</b>
1.1	PURPOSE OF THE DOCUMENT .....	3
1.2	MISSION AND PRESENT FIELD OF ACTIVITIES .....	3
<b>2</b>	<b>ORGANISATION AND COMPETENCIES , WORKING BODIES.....</b>	<b>3</b>
<b>3</b>	<b>CHANGES RELATING TO THE OVERALL ENVIRONMENT.....</b>	<b>5</b>
3.1	Changes in the business environment .....	5
3.2	Environmental changes: .....	5
3.3	Changing social constraints :.....	6
3.4	New technological possibilities :.....	7
<b>4</b>	<b>TARGET GROUPS &amp; CUSTOMERS NEEDS.....</b>	<b>7</b>
4.1	Needs of Public Authorities, Regulators, Consumers :.....	8
4.2	Needs of Technical & Asset Groups :.....	8
4.3	Needs of Operators Group.....	8
4.4	Needs of Science, education group and International organizations.....	9
<b>5</b>	<b>OPPORTUNITIES AND THREATS.....</b>	<b>9</b>
<b>6</b>	<b>THE PRESENT SITUATION OF STUDY COMMITTEE B2.....</b>	<b>10</b>
6.1	Strengths of SCB2 .....	10
6.2	Weaknesses of SCB2.....	10
<b>7</b>	<b>OBJECTIVES AND STRATEGY.....</b>	<b>10</b>
7.1	Ambitions and objectives .....	10
7.2	Strategic administrative directions .....	11
7.3	Strategic technical directions.....	11
<b>8</b>	<b>CHANGES TO THE OPERATION OF THE STUDY COMMITTEE.....</b>	<b>12</b>
<b>9</b>	<b>CONCLUSION.....</b>	<b>14</b>



## **CIGRE STUDY COMMITTEE B2: "OVERHEAD LINES"**

### **STRATEGIC PLAN 2008-2017**

## **1 INTRODUCTION**

### **1.1 PURPOSE OF THE DOCUMENT**

The purpose of this Strategic Plan is to describe the long term objectives and ambitions of CIGRE Study Committee B2. It is a necessary tool in evaluating the present situation (customer needs) and for planning and organization of future activities including the build-up and conservation of competence. It also provides guidance for the assessment and development of working group activities.

It is proposed that this Strategic Plan spans over **a ten year** period and is updated every **3 or 4 years** in order to allow for adaptation to the developments and trends. The plan is completed with a Study Committee Action Plan covering a three-year period.

### **1.2 MISSION AND PRESENT FIELD OF ACTIVITIES**

According to the Statutes, the objective of CIGRE is facilitation and promotion of the interchange of technical knowledge and information between all countries in the general field of electricity generation and transmission at high and extra high voltage. The mission of CIGRE Study Committee B2 is derived from these overall objectives as follows:

**The facilitation and promotion of the interchange between all countries of technical knowledge and information in the field of overhead lines.**

The field of activities of Study Committee B2 covers **design, construction and operation** of overhead lines including the **mechanical and electrical ( in cooperation with SC C4) design of line components** (conductors, ground wires, insulators, accessories, supports and their foundations), **validation tests, the study of in service performance, the assessment of the state of line components and elements, the maintenance, the refurbishment and life extension as well as upgrading and uprating of overhead lines.**

The output of the deliberations and actions would enable **quality, capability, availability, maintainability, and the ability to raise capital and insurance to be realized.**

## **2 ORGANISATION AND COMPETENCIES , WORKING BODIES**

Study Committee B2 consists of a Chairman, a Secretary, Regular Members, Observers , Working Group Convenors, Special Reporters and Advisers. Participation comprises the following representatives:



Representatives from	%
Asset owners and operators	68
Manufacturers/industries	13
Universities, research institutes	5
Institute	8
Other	5

SCB2 is composed of Advisory Groups and of WG, JWG.

The Advisory Groups have in charge to advice SC Chairman as far as Strategy, Customer needs, Technical directions and satisfaction and Publications are concerned .

The Customer Advisory Group is mainly in charge of analysing and prioritising the needs of Target groups. He also checks that WG objectives are answering well to these needs.

The Publication and Tutorial Advisory Group is in charge of all publication of SCB2 and of communication to young engineers and students through, for example, tutorials.

The technical Advisory Groups provide advice for assisting the Chairman in the definition of the directions to be followed by the SC. It provides advice and is not normally involved in the preparation of documents for external publications ; still, some of their production can be deemed of interest for publication, especially in ELECTRA.

Their responsibilities are :

1. to coordinate WG within the scope of the Technical AG ;
2. to identify future direction of the technology in the technical area.
3. to prepare new items of work and to submit them to CAG and SC Chairman
4. to coordinate TUTORIALS between different WG ;
5. to attract new Members and retain existing members

Working Groups (WGs) are the main operational bodies of the SCs. They are designed to perform specific technical activities which are expected to be carried out within limited and pre-determined periods of time.

Most of the Study Committee members have substantial experience in the field of overhead lines and are used to work in a global scale. Together they represent a vast body of experience and knowledge in all questions related to overhead lines.



### **3 CHANGES RELATING TO THE OVERALL ENVIRONMENT**

This section identifies development and trends in the power supply sector and assesses the possible effects on lines in general and the activities of SCB2 in particular.

#### **3.1 Changes in the business environment**

The changes in the power sector include the unbundling of the generation, transmission and distribution activities, the abolishment of institutional barriers for independent power producers, changes in the financial structure of asset owners and operators and an increased emphasis on competition. Third party access to the transmission system leads to a more intensive use of the system and will enforce an improved power flow control increasing the demand for power transfer of the line.. Power quality will increasingly be specified and paid for. The return on investment will need to be made in terms of three to five years.

The increasing competition is changing the traditional roles in the power industry. The asset owners and operators are increasing their competitiveness by means of focusing on their core business, by increasing their process efficiency and by merging in order to utilise economy-of-scale advantages. Consequently it is getting increasingly difficult for small and mid-size asset owners and operators to justify the costs of maintaining a complete technical infrastructure. The manufacturing industry on the other hand is also developing towards large world-wide corporations with potential and resources to provide not only components in the traditional way but also complete power system solutions. The growth of the energy demand has slowed down in the industrialised countries and the redundancy of the present transmission and distribution system is increasingly utilized. Consequently, the construction of new networks has partly stagnated and greater emphasis is given to the maintenance and life extension of components.

The access to grid gives rise to short time horizons for planners as well as situations whereby lines will be operated at the maximum thermal load soon after construction.

The consequences of environmental events such as wind and ice storms are more severe than ever before due to the reduction in network redundancy.

#### **3.2 Environmental changes:**

The emphasis put on use of land, visual impact of lines, pollution, energy efficiency, global warming aspects and various hazards (like leakage, noise, electromagnetic fields) is continuously increasing. Requirements on minimum environmental impact during the life of the equipment will necessitate Life Cycle Assessment (LCA), including recycling of older equipment. Assessment of the impact on the environment may become a necessary part of the investigation done prior to obtaining permissions for new lines.

In industrialised countries and in metropolitan areas of developing countries it is increasingly difficult to get new right-of-way for transmission lines. Asset owners and operators are therefore more or less tied to present line routes with increasing need to operate existing facilities closer to the limits, implying use of more sophisticated control, monitoring, and data



processing equipment. Right-of way constraints may contribute to a wider use of cables and/or gas insulated lines for power transmission.

The pressure for going underground must be expected to increase. More and more power connections will be established as underground cables.

Underground cables, Overhead lines should be seen as complementary solutions to build new links than alternative ones.

Other environmental trends of importance are increased emphasis on energy efficiency and use of renewable energy sources, and an increasing hostility in the society necessitating the use of measures to ensure adequate security.

The increase in the past few years of devastating environmental events such as was experienced in France, Canada, USA (Tornadoes, hurricanes and ice storms), Australia and Brazil (High Intensity Winds). These events have been wider spread than was previously experienced resulting in disruption of networks far in excess of the normal planned contingency. Public Authorities, Regulators, Top Management, Consumers, all these Target Groups ask to the Designers of OHL and of Electric Power System :

1. to build OHL whose design principles are focused on a very low probability of human accident.
2. to develop an Electric Power System which guarantees a high level of continuity of service : *this can be done by building several overhead lines, underground lines or by developing emergency restoring methods or by upgrading existing lines ,...*

### **3.3 Changing social constraints :**

Consumers, manufacturers are relying more and more on electricity supply. It's more and more difficult to de-energize OHL and the reliability of the Electric System needs to be higher and higher.

All these reasons lead to asset owners and operators having to get more out of existing lines in terms of life expectancy as well as power transfer.

The assessment of condition of lines is also vital in determining the methods by which the life expectancy can be determined as well as methods to increase the useful life of the line. The power transfer of the lines will need to be increased either by utilizing the weather conditions prevailing at the time or by utilizing devices that can reduce the impedance of the line. Lines may also need to be up rated by increasing the voltage of the line. This would depend on the reliability permitted on the line as well as the ability to perform live line maintenance on the line.

Reliability and effective maintenance are likely to become more critical as the number of lines decreases for a given load. Each servitude or power corridor will be required to be utilised to the limit.

### 3.4 New technological possibilities :

The advent of flexible ac transmission systems (FACTS) will enable the lines to be operated at the thermal limit more often. This is because the present system limitations such as voltage and stability limits can be overcome. It will also be possible to reduce the line impedance by FACTS devices without reducing the phase spacing. This enables existing lines to be utilised to a greater limit than was possible before.

The development of new high temperature composite core conductors will give the possibility to increase power flow of old lines in the range of 30 to 50 % with small changes on towers.

Further improvements of the line utilization may also result from real-time monitoring of the conductor temperature.

## 4 TARGET GROUPS & CUSTOMERS NEEDS

The SCB2 is a part of CIGRE and as such has the responsibility to share information and promote interchange of technical knowledge between countries. In the past the countries who – were members of CIGRE had large utilities that were generally vertically integrated. Members were from the utilities to a fairly large extent. At present the utilities are privatising and forming asset owners and operators. They are also downsizing and reducing technical staff. Support for overseas trips is also reduced. This means that the membership that is active is changing to manufacturers and consultants. This needs to be taken into account.

But, who are the **Target Groups** and who are the “**real**” **Customers** of SCB2 ?

The Target Groups identified are:

- 1– Top, Management, Executives
- 2- Commercial Group : Consumers, Regulators, Energy Traders,..
- 3- Technical Groups: Equipment Suppliers, consultants, grid planners
- 4- Asset Group : Asset Owners, Asset/Facility Managers,..
- 5- Operators Group : Power System operator, Distributors, Grid Planners,..
- 6- Public, Science and Education Group: Governing Authorities, Universities, Research Institutes, Media, ...
- 7- International Organizations: CIREN, IEEE, IEC, CENELEC, ASCE

**The Asset Owners and Operators in different countries are seen as the main customers of SCB2.** But, they are not the only ones : governing authorities, consultants and manufacturers beyond to target groups whose needs have to be taken into account.

SCB2 has therefore to be fully aware of the direction and **needs** of governing authorities, asset owners and operators in terms of technical information, guidelines, brochures and standards. The needs of the consultants, standards authorities and manufacturers would be based on these needs.

SCB2 would therefore derive technical guidelines, brochures, and papers and provide input to standards based on these needs which are described hereafter.

#### 4.1 Needs of Public Authorities, Regulators, Consumers :

One major need from these target groups concerns the **reliability** of OHL. Following questions are often raised :

- Are the Standards adequate as far as Public Safety and Continuity of Service are concerned ?
- Are representative climatic data available and are the weather assumptions valid ?
- How can we assess the reliability of existing overhead lines ? What is the effect of age of components on the OHL reliability?
- How can we improve continuously the probabilistic design methods of OHL, including security, safety and continuity of service ?
- How can we develop emergency response plans with appropriate manpower, material and equipment resources to address (identified) OHL emergency situations ? How can we improve preparedness ?
- What is the optimum equilibrium (balance) between the costs of reinforcing (upgrading) OHL to a higher reliability level and the costs of preparedness including restoration actions and revenue lost after possible OHL failure events ?

#### 4.2 Needs of Technical & Asset Groups :

From these target groups, main questions raised concern maintenance, vegetation management, power transfer capability and other uses of supports :

- Diagnosis Methods to prevent failures,
- Optimal use of foundation designs,
- How do we estimate remaining life of insulators, of supports, of foundations, of conductors and accessories and how do we manage all technical data ?
- How do we increase power transfer capability of existing OHL ?
- How do we manage the risks due to load flow capacity increases in Transmission Overhead Lines ?
- How OHL supports can be used to perform other functions (e.g. to communications data) ?
- How to manage Return of Experience in order to increase the reliability of the network?
- How can we increase the transfer capability of very long OH lines : direct current ? Extra high voltage for in development countries ? ...

#### 4.3 Needs of Operators Group

The major concern is technical performance of OHL in all conditions :

- How can we assess the Risk of existing lines for more accurate or updated meteorological data ?
- How can we reduce cost of maintenance without decreasing reliability of OHL ?
- How do we manage vegetation and maintenance planning ?



- What is the line performance under dynamic loading ?
- How can we track fires with an aim to reduce faults due to fires ?
- How can we reduce faults due to lightning ?

#### 4.4 Needs of Science, education group and International organizations

SCB2 has to define the main subjects of concern and research that Science and Universities can work on. For example, it is still necessary to purchase high level studies in order to have a better knowledge on electrical and mechanical behaviours of OHL :

- Update of IEC & CENELEC Standards: e.g. IEC 61774 “Overhead lines – Meteorological Data for Assessing Climatic Loads”, IEC 60826, CEN 50341,...
- What are the effects of dynamic loads on supports, foundations, conductors and accessories ?
- What are the effects of new technologies (FACTS, New Composite conductors,...) on Electric Power system in terms of power transfer capacity, of protection,...

This kind of subject is linked with Education of students and young engineers and with international standard organisations.

## 5 OPPORTUNITIES AND THREATS

The changing working environment causes threats and opportunities to the work of SCB2. The most important **threats** are listed in the following:

- Fragmentation/internationalisation of asset owners and operators: how to reach the real customers?
- Different customer groups (asset owners and operators) are not easily represented in a study committee
- Increased cost pressure means that asset owners and operators have less resources available for international research activities and for international co-operation in general and that it is increasingly difficult to find experts which are able to devote sufficient time to working group and task force activities
- Increased competition makes asset owners and operators more aware of the value of “intellectual property“, resulting in tendencies to limit exchange of technical know-how
- Differences in the expectations on the CIGRE-work from industrialised and developing countries
- Large manufacturing corporations: smaller amount of variety in offered solutions; one manufacturing company might have several representatives in the same committee (from different countries)

**Even if target groups or consumers are not well represented within SCB2, their needs must be well defined and taken into account.**

On the other hand, **the changes in the operational environment of the SCB2 offer also opportunities**, for example:

- Possibility to meet new needs
- Adaptation of new technologies.
- Satisfying specific needs of the developing countries

- Increasing needs for refurbishment, upgrading, uprating, life extension
- New types of customers bringing new interesting challenges
- Mitigation of environmental impact
- Co-operation with other study committees, research and standardisation organisations

## **6 THE PRESENT SITUATION OF STUDY COMMITTEE B2**

### **6.1 Strengths of SCB2**

SCB2 has an active membership consisting of experts from many disciplines. This includes civil, electrical, and mechanical as well as environmental, meteorological experts and physicists. The expertise of the group ensures that it can identify and resolve any issue relating to lines.

### **6.2 Weaknesses of SCB2**

- Aligning working group topics to the needs of customers
- Limited addressing of specific problems of developing countries
- CIGRE-work and standardization work is too slow in respect to the rapid technological development which is taking place
- The SCB2 work is not sufficiently based on economics which is a major concern in the present context of deregulation and competition

## **7 OBJECTIVES AND STRATEGY**

### **7.1 Ambitions and objectives**

Study Committee B2 shall continue to play a pivotal role in the field of overhead lines. There appears to be no need to alter the field of activities of the study committee.

Within its field of activity study committee B2 shall:

- ◆ Serve all its customers involved in the process of transmitting electrical energy by means of :
  - Being aware of customers needs
  - Monitoring and reporting on the international development
  - Promoting trends beneficial for its customers
  - Issuing guidelines and recommendations
- ◆ Promote and recommend innovative solutions and concepts considering all relevant factors (economical, technical, environmental and others)
- ◆ See the line as an integral part of the network and ensure overall optimized system solutions by means of active co-operation with the systems oriented study committees of CIGRE.
- ◆ Be aware of the needs of the developing countries, actively work in order to fulfil them and involve representatives for these countries in its work. This implies increasing the scope to include lines below 110kV.

- ◆ Actively promote and support international co-operation and conferences.

## 7.2 Strategic administrative directions

### a1. Organisation of work

The organisation 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.

### a2. 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 of lines.

### a3. Communication

**a3.1 increased international appearance:** regular publications and contributions ( TUTORIALS) to symposia and sessions; presentations during regional conferences to local students and OHL engineers.

**a3.2 feedback:** to improve feedback from the “customers“ of the study committee

**a 3.3 decision makers:** to develop communication with decision makers.

**a 3.4 use of SCB2 website :** SCB2 web site is the official mean of communication between members..

## 7.3 Strategic technical directions.

The above factors put the focus of SCB2 on methods to :

- get more out of existing lines,
- provide for more reliable lines,
- ensure environmentally compatible lines,
- as well as to operate lines at their thermal limit.

This can be expressed in terms of the present and future activities of the WG's as is described below. This list gives some examples as it is not exhaustive and will be updated regularly, according to the needs of our customers.

These factors lead to a number of important areas that need to be studied in relation to overhead lines.

1. Assessment of the condition of line components
2. Improvement of tools and methods for inspection
3. Improvement of tools and methods for assessment.

Determination/measuring of actual support strength

Determination of corrosion state of steel poles



### Determination of the state/strength/corrosion of guys/stays/foundation components

4. Use and development of Information Systems and Geographical Information Systems.
5. Methods to increase the life span of existing lines and Guide for prediction of remaining life of components.
6. Factors that affect reliability of lines.
7. Factors to determine the reliability of existing lines (in collaboration with IEC & CENELEC).
8. Methods that will increase the reliability of lines (in collaboration with IEC & CENELEC).
9. Studies of the weather systems to better develop line loading criteria from a mechanical viewpoint (in collaboration with IEC).
10. Factors that limit the power transfer of lines.
11. Methods whereby the power transfer capability of the line can be increased: use of HVDC technology or UHV overhead lines up to 1100 kV for AC and 800 kV for DC lines.
12. Methods which allow to estimate the risk due to the increase of load –flow capacity : identification of the risk, evaluation, classification, and solutions to treat them
13. Design of supports that will allow for maintenance and upgrading.
14. Live line maintenance for improving reliability and cost effective asset management
15. Environmental restrictions and the likely future requirements.
16. Design improvement of the footing area.
17. Guidelines on how to meet environmental criteria without jeopardizing the integrity of the network needs.
18. Use of line structures to perform other functions than enabling transmission of power. This could include communication and fibre circuits, microwave transmitters, advertisements.
19. Dynamic behaviour of transmission lines under unbalanced loads or failure loads, subject which is not taken into account in any standard and dynamic strength of line components
20. Reduce cost of OHL
21. Safety of workers

Each of these will be dealt with in turn.

## **8 CHANGES TO THE OPERATION OF THE STUDY COMMITTEE**

In line with the new rules of Study Committees, the working groups cannot exist for longer than 4 years. The main reason for this is to improve the output of the working groups and to



adapt the Working Group Activities to the needs of SCB2 Customers. As SCB2 has a number of groups that have a life of longer than 4 years, it was necessary to change the manner in which the WGs operate. The challenge was to ensure three main points:-

1. The productivity of the Study is to improve with no disruption of present tasks
2. The networking benefit realised with present groups is not to be disrupted
3. The continuity of documents and information is to be maintained.

The other problem was to avoid a large amount of working groups being generated with no chairman or secretaries to pick up the workload.

In order to fulfil these requirements, 3 procedures have been established and Advisory Groups created :

1. the introduction of new topics and creation of new WG : SCB2PROC\_05\_01
2. the publication of documents : SCB2PROC\_05\_03
3. the archiving of important WG documents : SCB2PROC\_06\_1.



## 9 CONCLUSION

This Strategic Plan describes long term objectives and ambitions of CIGRE SCB2 “Overhead Lines” according to the main changes relating to the overall environment (unbundling, minimum environmental impact requirements, consequences of exceptional events such as wind or ice storms, social constraints,..).

It is based on an analysis of Target Groups needs which are listed and on which strategic technical directions are given for future activities ( methods to get more out existing lines, to provide more reliable lines, to ensure environmental compatibles lines, to operate lines at their thermal limit).

The government of SCB2 is also adapted to this changing operating environment, aiming at increased flexibility and short response time.