SMB/7516/R

STRATEGIC BUSINESS PLAN (SBP)

IEC/TC OR SC:	SECRETARIAT:	DATE:
IEC TC86	**USA**	**2021-10-29**

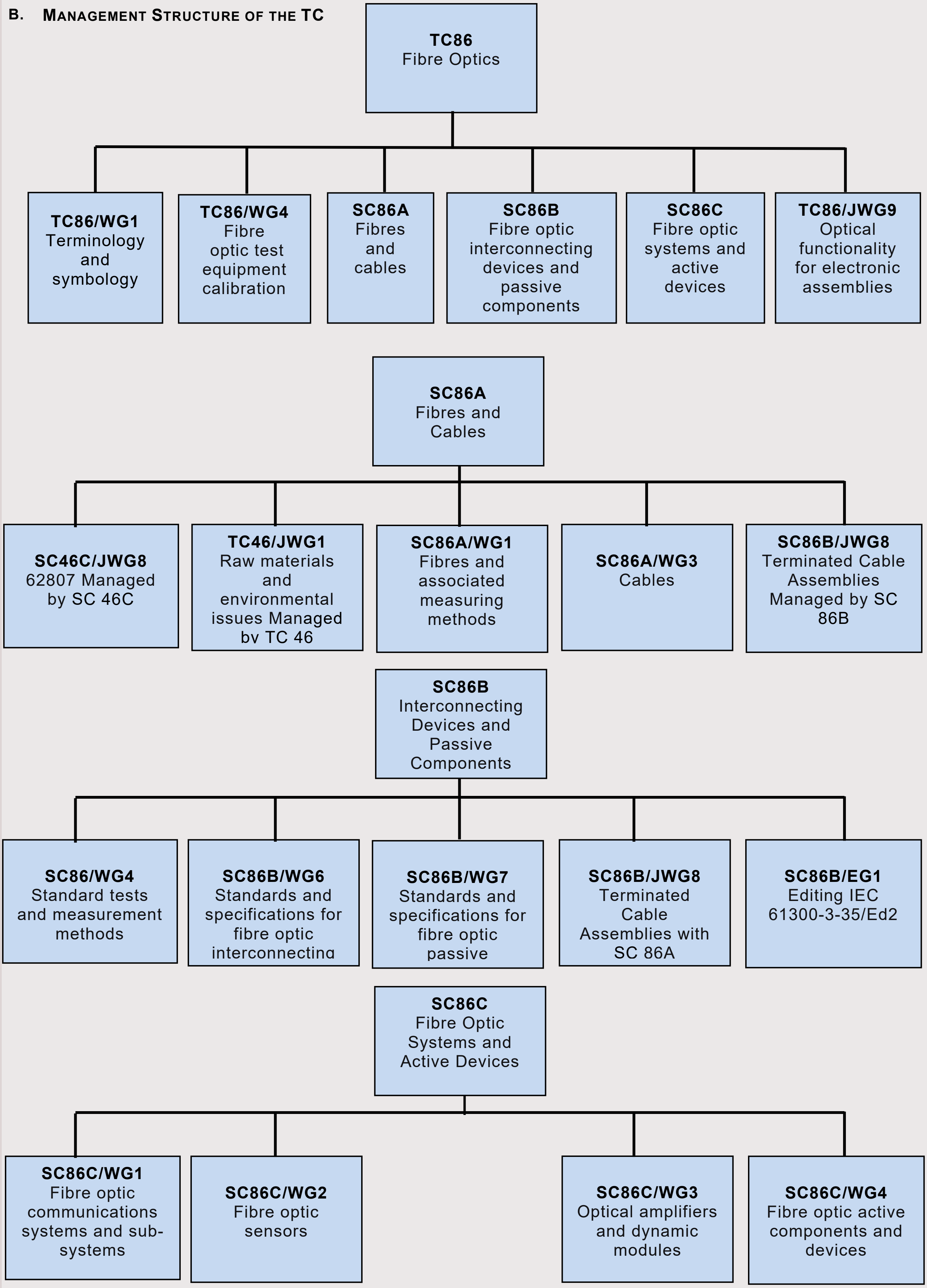
Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting or sent to the Central Office promptly after its contents have been agreed by the committee.

A. STATE TITLE AND SCOPE OF TC

TC86 Fibre Optics

To prepare standards for fibre optic systems, modules, devices and components intended primarily for use with communications equipment. This activity covers terminology, characteristics, related tests, calibration and measurement methods and functional interfaces. Optical, environmental and mechanical requirements are defined to ensure reliable system performance.

B. Management Structure of the TC



C. Business Environment

New products are emerging, e.g. optical circuit boards, photonic integrated circuits, multi-core fibres, hybrid cables, hybrid connectors, expanded beam connectors, very small form factor connectors and fibre optic sensing devices. Additionally, as technologies converge, more communication technologies are being realized using optical solutions.

A challenge for TC86 is contributing to closing the worldwide digital divide to minimize social loss, particularly mitigating worldwide pandemic effects, by making fibre-optic connectivity affordable for telemedicine, distant learning, remote work, infrastructure health monitoring and disaster prevention, while attracting the participation of these new market entrants to the IEC and TC86's work.

TC86 will continue to strive to develop a useful base of standards for these technologies to utilize in development of optical communication systems.

D. Market Demand

The work of TC86 and its Subcommittees continue to make a profound impact on the broad communications and fibre optics market. While external factors can impact the markets and commerce for fibre optics devices and systems, the market has undergone steady growth and diversification of fibre optics applications. This has resulted in continued global participation by users and suppliers, as well as a shift from a few participants from large organizations to more participants from smaller organizations. Additional underlying trends are market consolidation in traditionally evolved countries and the introduction of new important players from developing and newly industrialized countries.

There continues to be significant growth in the use of high-speed data across several diverse applications. This has lead to deeper penetration of communications and data transmission related applications that use fibre optic technology. While the market for long haul communication applications has remained somewhat saturated, demand continues to grow in rural (backhaul) communications, LANs, data centres, residential cabling, industrial cabling and automotive applications.

Demand has increased steadily in metropolitan and local access networks. This includes applications known as “the last mile” or Fibre to the x (FTTx, where x stands for curb, node, cabinet, premises building or home), stimulating optimized fibre designs (e.g. bend enhanced fibre and multicore fibre designs) and cable designs (like high fibre count compact cables).

The worldwide market for Fibre Optic Cable is shown in Figure 1. As is evident, the underlying data transmission demand has resulted in continued market growth.

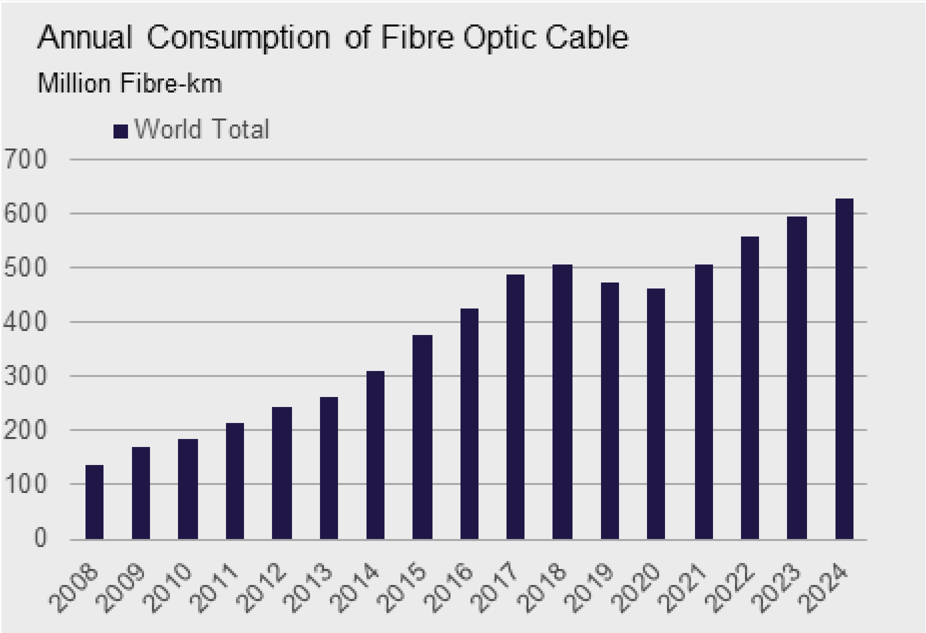


Figure 1 – Worldwide Consumption of Fibre Optic Cable
(Source: Used with permission from CRU International, www, crugroup.com)

It is expected that the continuous increase of fibre optics technology penetration in the networks of many countries worldwide will contribute to guarantee a steady market growth for the broad range of products falling under the TC86 standardization scope.

In addition to the previous bottom-up driver, a synergic top-down driver for optical technology market increase can be identified in the investment programs that some central or local governments plan to devote to the modernization of telecommunications infrastructure as a vital country asset (like other countrywide infrastructures, e.g. railways, airports, motorways, power transmission, etc.). Such public programs, intended to stimulate rather than follow market demand growth, may have a crucial effect of triggering applications and developments whose investments may not have been sustainable on a strict financial analysis.

In this context, the need for a “smart grid” from power sources up to the end users in all countries will create new market demand. “Smart electrification” will require transmission media in each of the grid segments and the smarter the grid, the higher will be the data rate requirements. This could result in more optical networks along overhead HV (high voltage) lines, as well as hybrid MV and LV cables including optical fibre use in the electrical distribution network and even in optical home networking.

For fibre-optic technologies outside the communication sector fibre-optic sensors are of renewed interest. This area is currently experiencing impressive growth. Market analysts estimate that the global consumption value of fibre optic point sensors and continuous distributed fibre optics sensor systems will continue to grow. Driving sectors are the oil and gas industry, power generation and distribution, and civil engineering. Upcoming sectors are the aircraft industry and all sectors with light weight constructions that need integrated structural robustness.

As technologies converge, TC86 will continue to explore application of existing or newly developed products in traditional areas (focusing on enhanced performance, wider usability, improved economics, and smaller, more dedicated spaces), as well as in new, emerging fields of application of optical technology (automotive, avionics, enhanced sensors, medical equipment, etc.), and for more demanding environmental and transmission requirements. Additional work is also foreseen in cooperation with other Technical Committees in the use or adaptation of TC86 work, as even low-bandwidth voice or data transmission (traditionally implemented by electrical circuits) is realized using optical transmission media.

Integration of optical and electrical blocks into photonic integrated circuits (PICs) is a major trend in the industry. There are strong research activities for PICs in Europe, Japan and USA. Target markets includes transceivers for short reach applications up to a few hundred meters to recent longer reach applications, and high-speed on-board optics for future networking and high-performance computing. In order to realize high throughput equipment, optical transceiver size reduction, together with the high-speed transmission, is the key issue to be realized. Integration technology such as PIC using InP/silicon photonics is one of the promising approaches for this field. A strong initiative in SC86C supports this trend.

E. Sustainability Development Goals

TC 86 Standards provide a foundation that allows our users to build sustainable technologies, to apply best practice, and to form the basis for innovation as well as quality and risk management.

Our primary activities support SDG 9: Industry, Innovation & Infrastructure, but we operate also in support of SDGs 4, 5, 8, 10, 11 and 17 considering that our activity is aimed to build a more efficient, resilient, widespread and economic information and communication infrastructure to enable innovation, technological progress and improved communication worldwide.

- ☐ **GOAL 1:** No Poverty
- ☐ **GOAL 2:** Zero Hunger
- ☐ **GOAL 3:** Good Health and Well-being
- ☐ **GOAL 4:** Quality Education
- ☐ **GOAL 5:** Gender Equality
- ☐ **GOAL 6:** Clean Water and Sanitation
- ☐ **GOAL 7:** Affordable and Clean Energy
- ☐ **GOAL 8:** Decent Work & Economic Growth
- ☒ **GOAL 9:** Industry, Innovation & Infrastructure
- ☐ **GOAL 10:** Reduced Inequality
- ☐ **GOAL 11:** Sustainable Cities and Communities
- ☐ **GOAL 12:** Responsible Consumption & Production
- ☐ **GOAL 13:** Climate Action
- ☐ **GOAL 14:** Life Below Water
- ☐ **GOAL 15:** Life on Land
- ☐ **GOAL 16:** Peace, Justice Strong Institutions
- ☐ **GOAL 17:** Partnerships to achieve the Goals

F. TRENDS IN TECHNOLOGY AND IN THE MARKET

In addition to the traditional telephony driven applications, the convergence of digital data, video and telephony markets has resulted in demands for ever increasing data transport throughput, resulting in stronger emphasis on technical aspects that limit transport data rates. These include improved and accurate measurement, calibration and reproducibility of parameters such as attenuation, return loss, polarization mode dispersion (PMD), chromatic dispersion and bandwidth. There is also a need for design guidelines and technical reports to explain measurements as well as the use and limitations in operational situations, in view of innovative modulation techniques, for very high capacity transmission links. In addition to the impact of higher bit rates, market demands have also led to conversion to optical transport for many point-to-point applications that were traditionally realized electrically. During this conversion period, more combined active/passive applications in the outside plant will be seen. The combination of active electronics in enclosures is creating a typical operating environment with higher operating temperatures due to “trapped heat”. Since most optical components are only specified for use in passive optical network elements, there will be a need to extend the temperature ranges in the existing environmental categories for optical components used in combination with enclosed active electronics.

The trend also continues towards integration of optical components and functions. Active/passive combinations, fibre application to optical circuit boards and optical equipment back planes, photonic integrated circuits (PICs), along with new classes of dynamically adaptive devices (known as dynamic modules and devices) are being addressed within TC86. A PIC is an integrated circuit on which operations can be carried out on light conveyed through it. One could think of a PIC as a miniature optical train, i.e. a sequence or collection of elements or structures, which perform an operation on one or more incident light beams. These operations may include modulation, wavelength dependent and independent switching, wavelength multiplexing/demultiplexing, power splitting, filtering, amplification, light generation (lasers) and light detection (detectors). Depending on the available chip size, element size and layout efficiency of optical elements and structures, a PIC can incorporate functions of varying complexity. There are different PIC types and materials, but Indium Phosphide and silicon PICs are the two leading PIC platforms. Silicon PICs form the basis of a new class of temperature resilient, micro-transceivers, which are manufacturable in volume and are therefore well suited to emerging dense on-board applications such as co-packaged optics in hyperscale data centre systems (e.g. switches and servers), 5G systems (e.g. Active Antenna Array systems) and high-speed optical communication in automotive and aerospace applications.

Higher densities of communications networks are also leading to the miniaturization of cables, connectors, passive components and network accessories and infrastructures. This in turn leads to newer classes of performance requirements and test methods to ensure the requirements of the optical transport system.

TC86 has developed new standards to address new optical fibre designs, including alternatives to all glass silica based fibres such as plastic or plastic clad silica, and new designs of optical fibres optimized for ultra-tight bends that will have a positive impact on installation practices and on the size of network elements.

Further developments include new optical cable designs for cables better matching their targeted installation environment. This includes optimized mechanical properties as well as fire behaviour and installation practices for dedicated cables.

Recognizing the market’s trend in cabling networks and customer premises wiring to transmit data, telecommunication and signalling services over optical fibre, metallic twisted pairs, and/or broadband data over coaxial units, while retaining the option of supplying electrical current to remote equipment, a standardization project for a series of documents covering hybrid cables, for applications such as 5G mobile networks, is being undertaken in a Joint Working Group with IEC SC46C. IEC TC86 is also cooperating with IEC SC48B on a standardization project for hybrid connectors.

In the next few years, quantum communication (e.g. quantum key distribution (QKD)) and quantum computing applications are expected to gain traction. Central to these applications is the requirement to send “entangled” photons, that is photons which have a special, distance-agnostic, quantum correlation, over optical networks without “decoherence”, which is the collapse of the shared wave-function of the entangled photons and therefore the link between them. This property of entanglement can be used to create extremely secure communication links (as in QKD) or form an integral part of a quantum computer network. Decoherence can be caused by direct measurement (in accordance with Heisenberg’s Uncertainty Principle) or by disruption to the photon propagation due to aberrations (imperfections) in the optical conduit. This emerging field is therefore expected to fuel demand for a new generation of lower loss optical cables and connectors, which will allow larger proportions of entangled photons to propagate over optical networks without decoherence, thus improving the efficiency of the quantum optical network.

In addition to the telecommunication area, work in fibre optic sensors has recently been re-instituted and promises to be an important growth area. IEC TC86 is cooperating with TC38 in this development effort.

G. System approach aspects (Reference - AC/33/2013)

TC86 and its Subcommittees are component committees dealing with optical fibres and cables, dynamic, active and passive optical components and optical sub-systems. However, in SC86C – Fibre optic systems and active devices, WG1 is working on interoperability and measurement aspects of fibre optic communication systems and sub-systems, considering the integration of fibres, cables and optical passive and active components in real optical networks.

TC86 and its Subcommittees act as supplier of component specifications for the systems specified in other bodies; consequentially, we are active in liaisons and external relationships to system international standardization groups such as ITU-T SG15 (Transport, Access and Home), IEEE 802 (LAN/MAN Standards Committee), ISO/IEC JTC1 SC25 (Interconnection of Information Technology Equipment), 1394TA and IEC TC100 (Audio, video and multimedia systems and equipment).

The awareness of all system aspects of the components that TC86 is called to standardize greatly helps TC86’s understanding of the market environment in which we operate and promotes communication, reciprocity and cooperation between TC86 and the numerous bodies with which we cooperate/interact.

TC86 and its Subcommittees also work directly in component specification work through liaisons to several IEC Technical Committees such as TC46 (Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories), TC48 (Electromechanical components and mechanical structures for electronic equipment), TC76 (Optical radiation safety and laser equipment), TC91 (Electronics assembly technology), and TC38 (Instrument transformers) as well as others.

H. Conformity Assessment

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H. 3-5 Year Projected Strategic Objectives, Actions, Target Dates

Strategic Objectives 3-5 years	Actions to support the strategic objectives	Target Date(s) to complete the actions
Continue to sustain the quality and appropriate work required by our industry enabling medium and long term growth	Manage the TC and SC organization, structure, frequency and location of meetings to ensure	

in relevant markets	improved efficiency and optimum use of expert time and resources Continue to measure and report voting and Plenary participation of the P-members of TC86, with the objective to ensure availability of experts to actively participate and contribute to technical meetings and to ensure that internal procedures are adapted to cope with voting on documents within the requested time periods Continue to measure projects average time, late projects and overall ranking within IEC TC's for number of documents published.	
Establish and nurture relationships to other Technical Committees and external organizations undertaking work relevant to TC86's mission • Feed those Technical Committees and external organisations that deal with optical systems with TC 86 relevant technical specifications to be referred to into their documents; • Utilise technical inputs (i.e. environmental, mechanical, performances requirements) that are provided by Technical Committees and external organisations to establish technical specifications that support actual market demand; • Nurture committees dealing with systems with technical specifications for new innovative products to be incorporated in their applications.	• Continuously improve quality, quantity, timeliness and effectiveness of joint work with the following groups: ○ IEEE on Optical power ground wire standards and LAN/MAN standards ○ ISO/IEC JTC-1/SC25 on Structured fibre optic cabling for building and premises applications ○ ITU-T SG-15 on Optical transport networks and access network infrastructures ○ TC45 on Radiation related testing of cables and fibres. ○ TC46 on Optical / electrical hybrid cables ○ TC48 on Optical / electrical hybrid connectors ○ TC76 on Safety aspects of fibre optics ○ TC91 on Optical functionality for electronic assemblies ○ TC100 on Optical and CATV amplifiers, as well as applications in and to the home.	

	• Look for new liaison opportunities ○ TC86 recently established a new liaison with ISO/TC 20, Aerospace electrical requirements and is considering establishing liaisons with ISO/TC22, IEC/TC9 and IEC/TC62	

Deliver useful documents for industry in a timely manner while minimizing market confusion or divergence of essential fibre optics definitions and product specification requirements.	• Continuously improve quality, quantity, timeliness and effectiveness of joint work with the following groups:
	  ○ IEEE on Optical power ground wire standards and LAN/MAN standards
	  ○ ISO/IEC JTC-1/SC25 on Structured fibre optic cabling for building and premises applications
	  ○ ITU-T SG-15 on Optical transport networks and access network infrastructures
	  ○ TC45 on Radiation related testing of cables and fibres.
	  ○ TC46 on Optical / electrical hybrid cables
	  ○ TC48 on Optical / electrical hybrid connectors
	  ○ TC76 on Safety aspects of fibre optics
	  ○ TC91 on Optical functionality for electronic assemblies
	  ○ TC100 on Optical and CATV amplifiers, as well as applications in and to the home.
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Continue to maintain the critical mass for all fibre optics related work, evolving as our industry and markets change, while ensuring that the composition of TC86 experts reflects the makeup of our industry.	• Review annually the industry market leaders in the areas addressed by TC86 Working Groups, with a goal of attaining increased representation of the major market manufacturers and users. • Proactively seek participation by new market participants, especially those from emerging economies and developing countries participating in the Affiliate Country Program • Continue to market the work and capabilities of TC86 in conjunction with the IEC communications department, through vehicles including e-TECH. This includes extending the use of brochures and seeking participation in relevant International Conferences and Events to increase awareness of TC86 activities in the fibre optics community.	
Note: The progress on the actions should be reported in the RSMB.		