Telecommunication Standardization Bureau

Geneva, 10 September 2021

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Subject: Updates on the Joint Task Force (JTF) on SMART submarine cables

Dear Mr Ryabinin,

I would like to share an update for the Joint Task Force (JTF) on SMART submarine cables. Please find the attached **TSB Circular 337** "SMART submarine cables contribute to SDGs – updates on the Joint Task Force on SMART submarine cables".

Yours sincerely,

Chaesub Lee
Director of the Telecommunication
Standardization Bureau

Attachment: 1 (TSB Circular 337 "SMART submarine cables contribute to SDGs – updates on the Joint Task Force on SMART submarine cables")

INTERNATIONAL TELECOMMUNICATION UNION
TELECOMMUNICATION STANDARDIZATION BUREAU

Geneva, 5 August 2021

Ref: **TSB Circular 337**

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To:
- Administrations of Member States of the Union;
- ITU-T Sector Members;
- ITU-T Associates;
- ITU Academia;

Copy to:
- The Chairmen and Vice-Chairmen of Study Groups;
- The Director of the Telecommunication Development Bureau;
- The Director of the Radiocommunication Bureau

Subject: **SMART submarine cables contribute to SDGs – updates on the Joint Task Force on SMART submarine cables**

Dear Sir/Madam,

1 I am pleased to share the updates on the Joint Task Force (JTF) on SMART submarine cables (see https://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx for details).

2 The concept of SMART (Scientific Monitoring And Reliable Telecommunications) cable systems calls for integrating sensors (ocean bottom temperature, pressure and seismic acceleration) in the repeaters of submarine cables for climate and ocean monitoring and disaster warning. To bring this concept to fruition, the Joint Task Force (JTF) was established in 2012 jointly with the World Meteorological Organization (WMO), and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC).

3 ITU-T Study Group 15 (SG15) created a new work item on SMART cables under Question 8/15 (Characteristics of optical fibre submarine cable systems) at an SG15 meeting in April 2021.

4 The Chairman of the JTF, Prof Bruce Howe (University of Hawaii) developed an open letter to call actions to all the stakeholders as in **Annex A**.

Yours faithfully,

(signed)

Chaesub Lee
Director of the Telecommunication
Standardization Bureau

Annex: 1 (with two appendices)

Annex A

An Open Letter from the Chairman of the Joint Task Force on SMART cables

Greetings All,

Climate change is *the* existential threat facing humanity. Earthquake and tsunami disasters destroy lives, property and economies. Collaboration and observations are required on a global scale.

The global submarine telecommunications cable network can be augmented with environmental sensors to form a global ocean and earth observing network to provide data to mitigate these threats while at the same time improving the integrity and resilience of the network.

As major stakeholders in submarine telecommunications cable systems – suppliers, owners, regulators and financers – you can help bring this concept of a shared submarine cable network to fruition, telecom + environmental monitoring.

The concept of SMART (Scientific Monitoring And Reliable Telecommunications) cable systems calls for integrating sensors (ocean bottom temperature, pressure and seismic acceleration) in the repeaters of submarine cables for climate and ocean monitoring and disaster warning.

To bring this concept to fruition, the International Telecommunication Union (ITU), the World Meteorological Organization (WMO), and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC) established the Joint Task Force on SMART subsea cable systems (JTF SMART Subsea Cables) in 2012. The JTF has 190 experts from more than 30 countries representing more than 110 organizations, including science, operational oceanography and warning services, suppliers, telecom owners and operators, international and national organizations and agencies, and more.

The information from SMART cables will be used for:

- Climate change monitoring including ocean circulation, heat content and sea level rise;
- Tsunami and earthquake early warning for disaster risk reduction;
- Seismic monitoring for earth structure and related hazards;
- Quantifying risk to inform sustainable development of coastal and offshore infrastructure, and
- Warning of external hazards to cables, and improved routing of cable systems

Please see **Appendix 1** for additional information on SMART cables technology and on international developments that are relevant to deployment.

We believe it is time to take the next major steps for SMART cables.

- Suppliers may publically step forward and offer SMART capability off-the-shelf;
- OTTs (over-the-top providers) as lead investors, owners and users may lead with more corporate social responsibility and facilitate SMART capability systems they are associated with;
- Regulators may require SMART capability with the associated societal benefits as a condition for the managed use of the public national and international domain by submarine telecommunications cables, and to improve cable integrity and network resilience for the public good; and
- Multilateral Development Banks may require SMART connectivity for climate and disaster risk reduction in the systems they fund for connectivity purposes.

Please see **Appendix 2** for possible ways forward.

We would like to bring to your attention that CEPT (European Conference of Postal and Telecommunications Administrations) will submit a draft Resolution intended to promote the deployment of SMART cable technology to the forthcoming ITU World Telecommunication Standardization Assembly, to take place 1-9 March 2022. We would appreciate your support for this draft Resolution.

In addition, ITU-T Study Group 15 (SG15) created a new work item on SMART cables under Question 8/15 (Characteristics of optical fibre submarine cable systems) at an SG15 meeting in April 2021. We invite

you to contribute to the work on SMART cables in ITU-T SG15. SG15 will also work on submarine cables dedicated to measurement only although dedicated cable for measurement is not in the current scope of the JTF.

SMART Cables expects to be endorsed as a project of the UN Decade of Ocean Science for Sustainable Development.

Once again, the submarine cable industry, as well as its users, is adapting to a new Era and we feel that the industry is beginning to be prepared to embrace a transition from "deaf, dumb, and blind to the environment" to modern day "smart" shared multi-use infrastructure that is fully aware of the environment and ecosystem within which it lives.

In conclusion we ask that you seriously consider the issues and recommendations we have raised in this letter and act on them to benefit society and the submarine cable industry.

JTF SMART Cables would be pleased to brief you at a time of your convenience on the SMART cables concept and the potential role of your organizations in the ocean and earth observing network that we envision. We look forward to discussing our common goals.

Arthur C. Clarke, creator of the concept of communications satellites, in his book "How the World Was One, Beyond the Global Village" wrote:

> *It is true that a submarine cable is not something that everyone can see, like a giant bridge, a skyscraper or an ocean liner. It does its work in the darkness of the abyss, in an unimaginable world of eternal night, cold and pressure, peopled by creatures which no man could have conceived even in the wildest delirium. Yet it serves a function as vital as that of the nerves in the human body; It is an essential part of the world's communication system – which, if it ever failed, would throw us back instantly into the isolation of our ancestors.*

Together, let us include sensors with the nerves and respect and honor the thoughts of Arthur C. Clark.

Sincerely,

Bruce M. Howe

Bruce M. Howe

Chair of the Joint Task Force

Professor, Ocean and Resources Engineering

University of Hawai'i at Mānoa

Appendix 1 (to Annex A)

Additional information on SMART cables technology and on international developments that are relevant to its deployment

The information obtained by SMART Cables fully respects the United Nations 2030 Agenda for Sustainable Development 2030, including Sustainable Development Goal 13 Climate, SDG-14 Oceans, SDG-9 Infrastructure and SDG-11 Cities, as well as the Sendai Framework for Disaster Risk Reduction 2015-2030. The UN Decade of Ocean Science for Sustainable Development 2021–2030 will facilitate the coordinated implementation of needed, new innovative technology to achieve the SDGs.

The international decadal conference Ocean Observations 2019 (OceanObs19) recommended: Transition telecom+sensing SMART subsea cable systems from present pilots to trans-ocean and global implementation, to support climate, ocean circulation, sea level monitoring, and tsunami and earthquake early warning and disaster risk reduction.

Building on a foundation of numerous workshops, published reports and papers (see attached 2019 white papers) and presentations and discussion at conferences and meetings around the world, we now have pilot systems getting underway.

These ongoing and proposed pilot systems, domestic and regional with government guidance and funding (and assuming risk), are well on the path to showing that SMART cables are technically and financially feasible (~10 percent incremental cost), while also resolving and setting precedents for permitting, legal, and security issues.

Several recent events have contributed to these positive developments:

- The Italian National Institute of Geophysics and Volcanology (INGV) has undertaken a technical "wet demo" project off Sicily, jointly funded by the government and the European Commission, to be installed 2022.
- The Portuguese Government, with guidance from its telecom regulatory agency ANACOM, directed that the new CAM ring (Continent-Azores-Madeira) "… enhance the use of submarine cables … such as seismic detection, environmental monitoring … Oceanography, Geophysics and Environment …." This culminated in the announcement in September 2020 describing the scope, implementation and funding for deployment, implementation and operation. Recent public conferences indicate this project is well underway for installation in 2024.
- In late 2019, the President of Indonesia issued a Regulation defining the structure of a revitalized tsunami warning system with cable-based tsunami warning at its foundation. Indonesia is currently implementing a hybrid SMART system in Makassar Strait, as a first step in a phased approach to developing the capacity leading to SMART systems monitoring the megathrust zone west and south of Sumatra and Java while providing improved telecom services to the Indian Ocean side of the country.
- Alcatel Submarine Networks issued a press release 29 September 2020: "Climate change is one of the major challenges that our society as a whole is facing today. … Our entire portfolio will benefit from this new "CC" (Climate Change) philosophy to propose dedicated applications such as TEWS (tsunami early warning system), monitoring of underwater seismic activity, global warming, and water temperature and level. … From now on, tackling climate change is an intrinsic part of our strategy and will drive our decisions." (https://web.asn.com/en/press-release/climate-change.html)

While the core of the SMART concept is the SMART repeater with integrated temperature, pressure and seismic sensors, recent developments in optical fiber sensing are expected to complement.

- Distributed acoustic sensing can measure fiber strain along the fiber, to a distance of ~100 km. Detection of nearshore trawling and anchoring (primary causes of cable damage), earthquakes and tsunamis, and more should be possible.
- Integral measures of strain over the entire length of the fiber have been made using state of polarization (SoP) and phase (Marra et al., 2018). A Google blog posting first showing a connection between submarine cable SoP and earthquakes concluded, "We see this approach not as a replacement of dedicated seismic sensors but as a source of complementary information to enable early warnings for earthquakes and tsunamis. We're humbled and excited by the possibility of collaborating with the optical, subsea and seismic research communities to use all of our cable infrastructure for greater societal benefits."
- NB: It is important to keep in mind that these methods are nascent, and more science understanding is required, especially to understand the amplitude portion of the signals.

Additional projects are in various stages of planning, including government driven ones (Indonesia, Vanuatu/New Caledonia, New Zealand-Chatham Islands, French Polynesia, Cayman Islands, Antarctica) and commercially driven ones (Australia, India-Oman, Western Mediterranean).

References

- JTF SMART Subsea Cables Web site: https://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx
- OceanObs'19 Community White Papers:
    - Howe, B. M., B. Arbic, J. Aucan, C. R. Barnes, N. Bayliff, N. Becker, R. Butler, L. Doyle, S. Elipot, G. C. Johnson, F. Landerer, S. Lentz, D. Luther, J. Mariano, K. Panayotou, C. Rowe, H. Ota, Y. T. Song, M. Thomas, P. Thomas, F. Tilmann, T. Weber, and S. Weinstein (2019) SMART Cables for Observing the Global Ocean: Science and Implementation, Front. Mar. Sci. 6:424. doi: 10.3389/fmars.2019.00424
    - Angove M., D. Arcas, R. Bailey, P. Carrasco, D. Coetzee, B. Fry, K. Gledhill, S. Harada, C. von Hillebrandt-Andrade, L. Kong, C. McCreery, S.-J. McCurrach, Y. Miao, A. E. Sakya, and F. Schindelé (2019) Ocean Observations Required to Minimize Uncertainty in Global Tsunami Forecasts, Warnings, and Emergency Response. Front. Mar. Sci. 6:350. doi: 10.3389/fmars.2019.00350

Appendix 2 (to Annex A)

Possible ways forward

As suppliers provide SMART capability off-the-shelf, buyers (initially governments, but transitioning to governments/MLDBs and then primarily commercial) will be able to add this capability to their system requirements, providing a positive feedback.

OTTs with their commercial influence in the market can facilitate the adoption of SMART Cables by helping to solve challenges rather than seeing them as insurmountable obstacles. Further, with their great public exposure, demonstrating concrete contributions such as SMART Cables, contributing to climate change understanding, disaster risk reduction and the SDGs, will go a long way to burnishing their public image. In both cases, suppliers and OTTs, public statements as demonstrated by ASN would go a long way to helping the effort.

The submarine cable industry has a long and lucrative history that has greatly benefited from the free use of the global seafloor Commons. It is time that the industry contributes also to the managed use of these Commons by providing environmental measurements, just as is done for Oil and Gas, and many other land-based industries. Regulators should facilitate this. This should not be regarded as a tax, but as a contribution/cost of doing business, mitigating detrimental effects of climate change and disasters which directly and indirectly affect the industry, per the ASN statement. The direct benefit to industry is a better understanding of the environment they operate in, both on a per-cable basis (e.g., specifics of detecting external aggression and hazards) and for the overall network (avoiding danger areas – e.g., it took many years to understand all the faults in the Luzon Straits to lead to re-routing).

Regulators, both on the telecom side for improved and resilient connectivity, and the environmental side for management of the Commons should require SMART capability in the industry and for cables they permit. More rapid permitting, reduced fees or taxes, and a common approach to cable protection can be provided as incentives to encourage adoption.

Multi-Lateral Development Banks (MLDBs) recognize that communication connectivity is essential in the modern world, and especially to raise the standard of living in developing countries. At the same time, they recognize that addressing climate change and disasters is just as important, if not more so, to improving the lot of developing countries. SMART Cables are one way Banks can address both, 2-for-the-price-of-1, combining societal connectivity and climate change and environmental sustainability into one. The support of Banks in this way, ideally as grants, would greatly facilitate adoption. Similarly, the reinsurance industry could be brought on board.

All of these needed actions are interrelated. Two examples illustrate how JTF activity currently underway will help bind them together.

A SMART Cable Resolution, now a European Common Proposal, is now being circulated in preparation for adoption by the ITU World Telecommunication Standardization Assembly (WTSA) (attached). It outlines much of the above with important concluding statements: " … instructs the Telecommunication Standardization Advisory Group … to coordinate the activities of the JTF SMART Cables with ITU-T study groups, other standards development organizations (SDOs), research institutes and other organizations and stakeholders to facilitate collaboration between the JTF SMART Cables and those organizations … instructs all study groups of the ITU Telecommunication Standardization Sector … to cooperate with the JTF SMART Cables to develop appropriate Recommendations …" This last is important because Recommendations often are used by stakeholders – suppliers, owners, regulators, and financers – as requirements. A supplier can tailor their product, an owner can include this as a requirement, a regulator can stipulate a system must conform, and a financer can include as a condition for funding. In April 2021, in parallel at the request of Italy and China, Study Group 15, Question 8, Characteristics of optical fibre submarine cable systems, took on SMART Cables as a Work Item.

The JTF SMART Cables is being considered for Endorsement as a Project of the UN Decade of Ocean Science for Sustainable Development 2021-2030. An outcome will be a Project Office (for which funding is being sought) within the Decade to facilitate and coordinate activities between all stakeholders on every continent and in every ocean.

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