Public Call for Evidence: Undersea cables

Written contribution to the UK Parliament's National Security Strategy Joint Committee (Commons) inquiry

06 March 2025

1. This response has been prepared by the Southampton Marine and Maritime Institute (SMMI), an internationally recognised centre of excellence for marine and maritime research, innovation, and education, part of the University of Southampton. The SMMI is a large multidisciplinary community of more than 400 ocean-facing researchers with a mission to advance knowledge and understanding of the oceans and to develop innovative solutions to tackle marine and maritime challenges by fostering collaboration between researchers, industry, policymakers, the third sector, and communities.

Our researchers have strong expertise and capabilities in marine and maritime research, offshore and coastal engineering. They investigate a spectrum of topics including maritime decarbonisation, ocean acidification, marine biodiversity, pollution, maritime safety and security, ocean governance, decarbonisation of shipping ports of the future, coastal communities, and maritime culture and heritage.

2. In relation to subsea cables, particularly concerning Question 5, Blair Thornton, Professor of Marine Autonomy, Susan Gourvenec, Professor of Offshore Geotechnical Engineering and deputy director of SMMI, and Dave White, Professor of Infrastructure Geotechnics, have conducted leading research into autonomous robotic monitoring of subsea communications cables.

Their work demonstrated that the specific inspection method developed at the University of Southampton can help protect exposed sub-sea communication cables by automatically detecting, imaging, and reporting potential threats. The method uses camera equipped Autonomous Underwater Vehicles (AUV) and develops intelligent subsystems to find, track and generate surveillance summaries of cables without interruption. The method can also identify potential threats before they cause damage, reducing inspection time and cost compared to remotely operated vehicles and minimising the delay between threat detection and awareness for human decisions, all without disrupting cable service.

A more detailed version of the work is available at:

- Autonomous robotic monitoring of subsea communication cables[1]
- Development of a prototype autonomous inspection robot for offshore riser cables[2]

3. In addition, to complement the Committee's knowledge and understanding of the critical role that subsea cables play from an engineering perspective, we wanted to bring to your attention additional published research conducted by and Dave White, Professor of Infrastructure Geotechnics and Justin Dix, Professor in Marine Geology & Geophysics:

- Increasing confidence in the prediction of axial friction factors for offshore pipelines and cables[3]
- New design methods for subsea power cables are helping the global marine renewable energy industry lower costs and improve reliability[4]
- The thermal regime around buried submarine high voltage cables[5]
- Environmental controls on the thermal performance of submarine high voltage cables[6]

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[1] Thornton, Blair, Bodenmann, Adrian, Massot Campos, Miguel, Simmons, Samuel, Gourvenec, Susan, White, David, Bennets, Tom and Newborough, Darryl (2024) Autonomous robotic monitoring of subsea communication cables. *Underwater Defence Technology 2024. 09 - 11 Apr 2024*.

[2] Gotts, Christopher, Hall, Benjamin, Beaumont, Oliver, Chen, Ziyang, Cleaver, William, England, James, White, David and Thornton, Blair (2022) Development of a prototype autonomous inspection robot for offshore riser cables. *Ocean Engineering, 257 (8), [111485]*.

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[4] Draper, Scott, Cheng, Liang, An, Hongwei, Fogliani, Antonino, Schläppy, Marie Lise, Tong, Feifei, Lipski, Wacek, Spradbery, Chas, Teng, Yunfei, White, David, Coles, Daniel, Noble, Stuart, Doole, Siobhan and Johnson, Fraser (2022) New design methods for subsea power cables are helping the global marine renewable energy industry lower costs and improve reliability. In *International Conference on Ocean, Offshore and Arctic Engineering: Materials Technology; Pipelines, Risers, and Subsea Systems*. vol. 3, The American Society of Mechanical Engineers.. (doi:10.1115/OMAE2022-80172).

[5] Emeana, C.J., Hughes, T.J., Dix, J.K., Gernon, T.M., Henstock, T.J., Thompson, C.E.L. and Pilgrim, J.A. (2016) The thermal regime around buried submarine high voltage cables. *Geophysical Journal International*, 206 (2), 1051-1064. (doi:10.1093/gji/ggw195).

[6] Hughes, T., Henstock, T., Pilgrim, J.A., Dix, J., Gernon, T. and Thompson, C. (2014) Environmental controls on the thermal performance of submarine high voltage cables. *HubNet Smart Grids Symposium 2014, Glasgow, United Kingdom. 09 - 10 Sep 2014.*

https://doi.org/10.5258/SOTON/PP0108