



SUBOPTIC
Bangkok | 2023

SubOptic Foundation Congress on Sustainability: **METRICS FOR SUSTAINABILITY**

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Company: New York University

Presenter Profile



Nicole Starosielski, Associate Professor of Media, Culture, and Communication at New York University, is author of *The Undersea Network* (2015) and is the Subsea Cable Lead of **Sustainable Subsea Networks**.

Sustainable Subsea Networks is a research initiative of the SubOptic Foundation, funded by the Internet Society Foundation. We are investigating the sustainability of the global subsea telecommunications network. We currently have three primary activities: generating a catalogue of sustainable practices, assembling carbon footprint of a cable system, and investigating policy and regulation.

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Members of the 2023 SubOptic Foundation Congress on Sustainability

Nigel Bayliff



Nigel Bayliff, CEO of Aqua Comms, is a global telecom industry veteran with more than 30 years experience as both operator & purchaser, and developer & constructor of significant submarine cable systems.

Mike Constable



Mike Constable's career spans more than 25 years in the submarine cable sector incorporating senior roles in both purchaser and supplier organisations including Chief Executive Officer of Huawei Marine Networks (now HMN Technologies).

Merete Caubet



Merete Caubet is VP Sales and Business Development at Bulk Fiber Networks, leading the expansion of Bulk into a key player connecting the world to the Nordics.

René d'Avezac de Moran



René d'Avezac de Moran oversees the global business development of services provided by Fugro to the subsea cable industry such as desktop studies and route surveys. René has been an employee of Fugro for over 20 years.

Michael Clare



Dr Mike Clare is a Principal Researcher in Ocean BioGeoscience at the National Oceanography Centre, UK. Since 2019, he has served as the Marine Environmental Advisor to the International Cable Protection Committee.

Emmanuel Danjou



Emmanuel is the Head of Business Development at Alcatel Submarine Networks. Emmanuel is a highly recognized and respected executive with over 24 years' experience in the telecommunications industry.

Members of the 2023 SubOptic Foundation Congress on Sustainability

Alwyn du Plessis



As CEO of Mertech Marine, Alwyn du Plessis has been leading a dynamic team of business development professionals, innovative submarine engineers and passionate metals and plastics recycling experts.

Takahiro Kashima



Takahiro Kashima is a submarine network business development and sustainability professional at NEC Corporation. He has been involved in international business and the development of IT and networking solutions, with a focus on energy saving technologies.

Brian Lavallée



Brian Lavallée is the Senior Director of Submarine Network Solutions at Ciena with 20+ years of experience spanning Marketing, Product Line Management, Systems Engineering, Research & Development, and Manufacturing. He holds a Bachelor of Electrical Engineering from Concordia University and an MBA from McGill University.

Andy Palmer-Felgate



Andy Palmer-Felgate is responsible for marine engineering and planning of submarine cable systems at Meta, and serves on the Executive Committee of the International Submarine Cable Protection Committee.

Dean Veverka



Dean Veverka is the CTO of the Southern Cross Cable Network and is responsible for all engineering, operational and regulatory issues. With over 40 years' experience in the industry, he is also the Vice Chairman of the International Cable Protection Committee.

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Why Metrics?



- **Regulation:**

- Regulation is coming
- It is better for the industry to be prepared with our own metrics instead of having them imposed

- **Green Finance:**

- Subsea cables may qualify as a green investment
- Private equity & others want to be able to assess sustainability of their holdings

Bottom Line: **We need metrics for what makes a subsea cable sustainable**



- **Sustainable Subsea Networks** team spoke with 25 subsea companies to catalogue best practices and challenges for sustainability
 - The *Sustainable Subsea Networks Report* will be published in July 2023
- In collaboration with industry, we have developed an **independent, science-based carbon footprint** to assess the major contributions to emissions



Sustainable Subsea Networks Map

TeleGeography

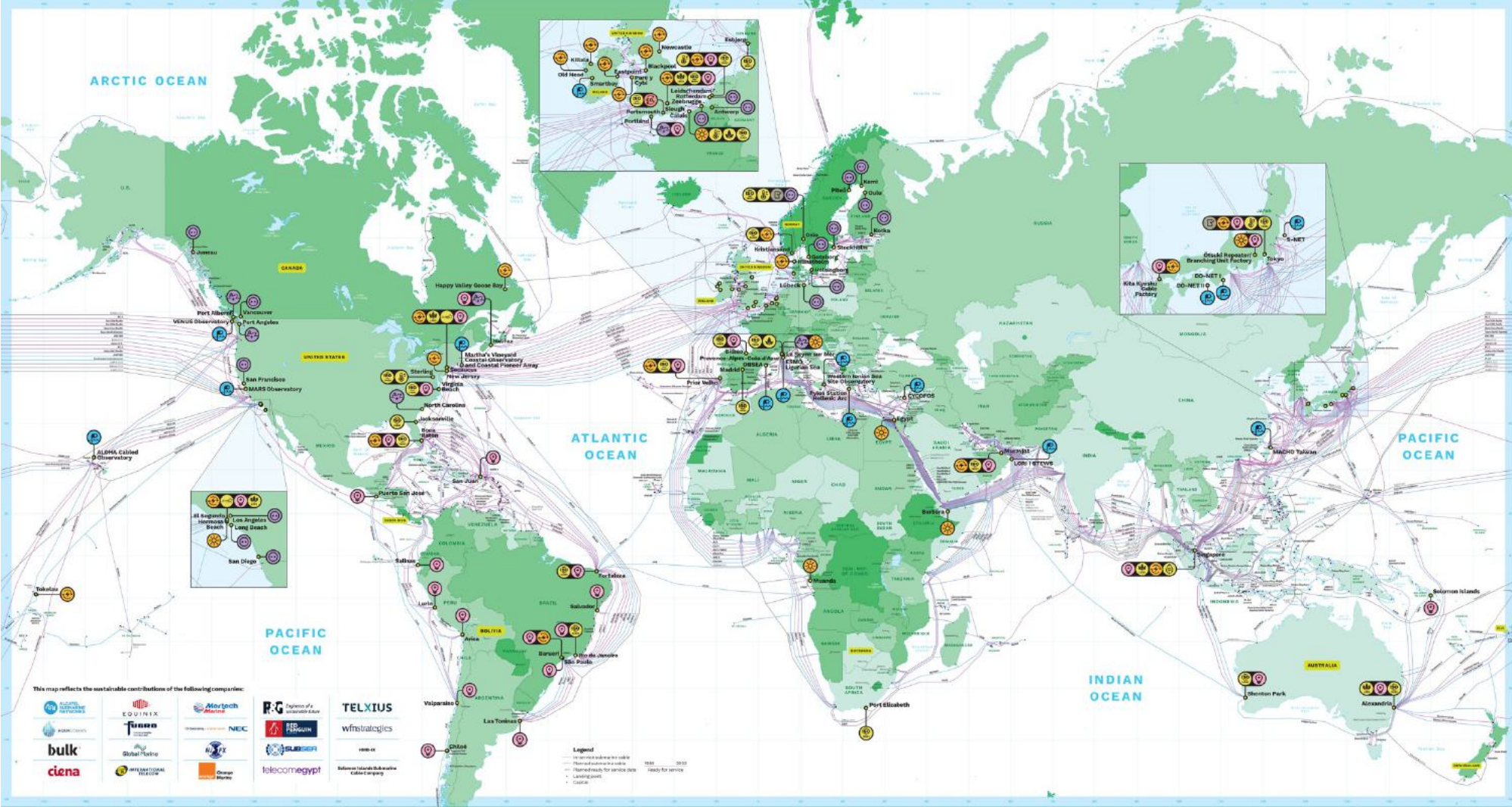
in partnership with
SUBOPTIC
FOUNDATION

Internet
Society
Foundation

SUSTAINABLE SUBSEA NETWORKS



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2023
Sustainable
Subsea
Networks
Map

-documents
best
practices

This map reflects the sustainable contributions of the following companies:



What makes a network sustainable?

Extend Lifetime
The more years a cable is in operation, the more sustainable it generally is.

Sustainability Award
Ciena, RSC, and RFA are a few of the best in their major sizes.

Increase Bandwidth
The more capacity, the more sustainable the network.
Upgrading capacity, as Ciena has with WaveLogic 8, means avoiding the construction of new cables.

Connect to Green Energy
Locating data centers and cable landings on green grids, purchasing carbon neutral power, and building renewable installations all reduce carbon emissions.

Lend Cables to Science
Scientists use ocean observatories and SMART cables to monitor ocean and climate conditions.

Meet Standards, Obtain Certifications, Commit to Targets
ISO 14001 Standard for Environmental Management
LEED Cert Ratings
Green Machine environmental certification
Energy Star Certification
Companies that achieve and disclose CO2 emissions.

Account and Disclose
Companies can track their carbon emissions and disclose them to the public.

Recycle Cables
Recycling returns cable materials to the circular economy and saves CO2 emissions.

Plug into Shore Power
When shore-side electric power is available for cable ships, they do not have to burn CO2 emitting-fuel.

Be Regulation-Conscious
These countries have established environmental regulation for data centers and/or landing stations.

Offset Emissions
Companies can offset their emissions and should favor durable carbon removals over tree planting and conservation offset efforts.

Be Energy Efficient
Owners of cable landing stations, factories, and ships have all pursued energy efficiency upgrades to reduce both CO2 impact and cost of electricity.

Protect Cables
A well-protected cable, and regulations that restrict cable damaging activities, leads to fewer repairs and less CO2 emissions.

| Material | Amount (kg) | CO2e (kg) |
|----------|-------------|-----------|
| Copper | 214.64 | 17,028.7 |
| Steel | 35,451 | 1,023,068 |
| Aluminum | 88,011 | 1,082,841 |
| Plastic | 5,882 | 84,875 |
| Total | 129,158 | 3,318,852 |

Recycling 1kg of material in the equivalent of saving 1.8kg of virgin material saves 1.8kg of CO2e.

*Figures represent the embodied CO2e in material extraction and manufacturing, but does not include emissions associated with recovery and recycling.



HOW SHOULD WE QUANTIFY THESE CONTRIBUTIONS?

Metric 1: Account and Disclose Emissions

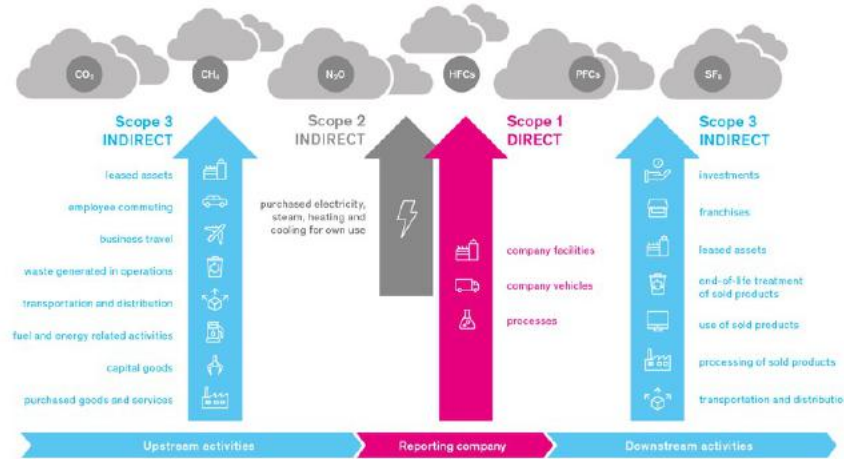
- **1.1.** Company calculates and discloses Scope 1 & 2 emissions
- **1.2.** Company calculates and discloses Scope 1, 2 & 3 emissions

For Debate: Should companies get credit for accounting without disclosing?

Bottom Line: To be sustainable, companies must calculate their Scope 1, 2 & 3 emissions and disclose them to the public

Metric 1: Account and Disclose Emissions

Scope 1, 2, & 3 Emissions:



Leading By Example:

ESG | Environmental | Social | Governance

Aqua Comms carried out a full review of scope 1 and scope 2 (tCo2e) use to enable emissions to be calculated on a site by site basis in 2021. In 2021 our scope 1 & 2 emissions intensity was 217 CO₂e/GWh

Southern Cross Cable Network conducts annual review of scope 1, 2 and 3 emissions. This enables the development of active carbon reduction programs.

Ciena accounts, reports, and discloses Scope 1, 2 and 3 emissions. In 2022, they measured all Scope 3 emissions and will disclose them in their next sustainability report in Spring 2023.

Fugro reports emissions data in line with the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard, and the Corporate Value Chain (Scope 3) Accounting and Reporting Standard under the 'Operational Control' approach. Fugro has reported vessel carbon emissions in its annual report and through CDP since 2018. Since 2019, also scope 1 emissions other than vessels, and scope 2 emission data have been collected and reported through CDP. 2020 is used as the baseline year, because the data quality of carbon emission data is constantly increasing following efforts to develop knowledge and awareness throughout the organisation and to improve reporting processes. Especially the completeness of scope 1 emissions from other sources than the vessels is improving. Fugro has reported only on CO₂, because this constitutes around 99% of Fugro's total greenhouse gas emissions.

Metric 1: Account and Disclose Emissions



Existing Framework: Carbon Disclosure Project



EQUINIX, INC.
Country/Area: United States of America

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | A |

NEC Corporation
Country/Area: Japan

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | A |

Fugro
Country/Area: Netherlands

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | B |

Telstra Corporation
Country/Area: Australia

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | A |

Alphabet, Inc.
Country/Area: United States of America

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | A |

Meta
Country/Area: United States of America

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | B |

Nokia Group
Country/Area: Finland

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | A- |

Ciena Corp.
Country/Area: United States of America

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | B |

Corning Incorporated
Country/Area: United States of America

| Year | Program | Status | Score |
|------|---------------------|-----------|-------|
| 2022 | Climate Change 2022 | Submitted | B |



Metric 2: Set Targets and Achieve Reductions



- **2.1.** Company has developed a target and reduction plan
- **2.2.** Company have achieved a certain % reduction year-on-year

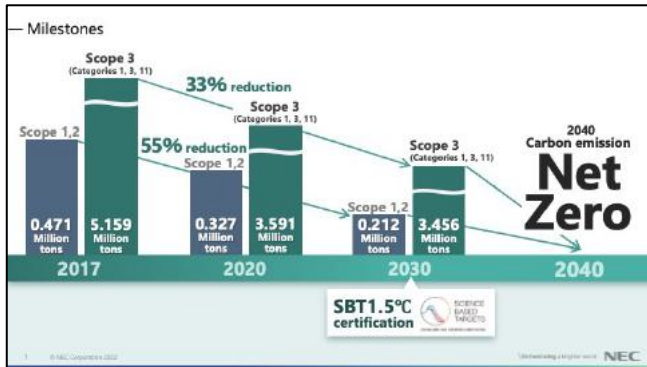
Bottom Line: To be sustainable, companies must outline a plan and ensure progress, however small



Metric 2: Set Targets and Achieve Reductions



Leading By Example:



NEC Corporation

In 2021 Bulk started to map emissions for full scope 1-3 according to the Green House Gas Protocol. Climate targets towards net zero have been set and the full scope 1-3 climate account will be used to take action to optimize solutions and mitigate emissions:

- Net zero company by 2050
- 50% emission reduction from scope 1 and 2 by 2030
- 30% emission intensity reduction from scope 1, 2, and 3 by 2030

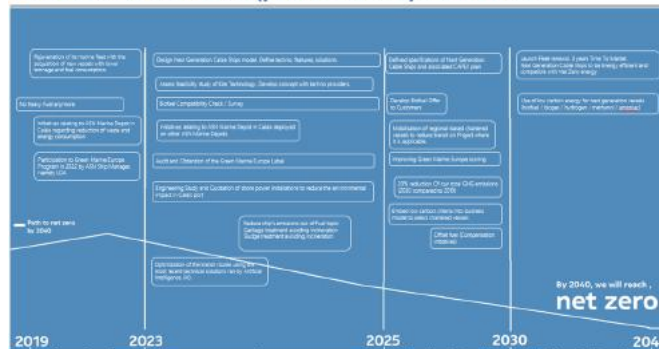
By taking action to reduce emissions and measuring the impact Bulk is gaining knowledge as we go on how fast we can reach net-zero, therefore the reduction targets will be revised yearly and becoming stricter so that we always strive to improve faster. Bulks reduction targets and pathway to net-zero will be aligned with the Science-Based Target Initiative (SBTI).

Bulk Infrastructure



Fugro

Nokia's net zero ambition (path to net zero) marine fleet



Nokia/ASN

In 2020, Ciena set a goal to “be carbon neutral across our reported operational emissions by the end of 2023”, and they are on track to achieve this goal. In 2022, they had a corporate objective to reduce Business Travel related emissions by 50% vs. 2019 levels.

Ciena

Metric 2: Set Targets and Achieve Reductions



Existing Framework: Science Based Targets (SBT)



| COMPANY/FINANCIAL INSTITUTION | TARGETS | | | ORGANIZATION TYPE | VIEW LESS ^ |
|--|---|-----------|--|-------------------|-------------|
| | NEAR TERM | LONG TERM | NET-ZERO | | |
| NEC Corporation ★ Japan, Asia | 1.5°C | - | COMMITTED | Company | |
| Date published/updated 2021 | Target summary Near term: 1.5°C by 2031 Net zero: Committed ★ Business Ambition for 1.5°C campaign member | | Target NEC Corporation commits to reduce absolute scope 1 and 2 GHG emissions 55% by FY2030/31 from a FY2017/18 base year. NEC Corporation also commits to reduce absolute scope 3 GHG emissions from purchased goods and services, fuel and energy related activities and use of sold products 33% by FY2030/31 from a FY2017/18 base year. | | |
| Sector Technology Hardware and Equipment | | | | | |

| COMPANY/FINANCIAL INSTITUTION | TARGETS | | | ORGANIZATION TYPE | VIEW LESS ^ |
|--|---|-----------|---|-------------------|-------------|
| | NEAR TERM | LONG TERM | NET-ZERO | | |
| Nokia Group ★ Finland, Europe | 1.5°C | - | - | Company | |
| Date published/updated 2017 | Target summary Near term: 1.5°C by 2030 ★ Business Ambition for 1.5°C campaign member | | Target Nokia commits to reduce absolute scope 1, 2 and 3 GHG emissions 50% by 2030 from a 2019 base year. | | |
| Sector Technology Hardware and Equipment | | | | | |

| COMPANY/FINANCIAL INSTITUTION | TARGETS | | | ORGANIZATION TYPE | VIEW LESS ^ |
|---|---|-----------|--|-------------------|-------------|
| | NEAR TERM | LONG TERM | NET-ZERO | | |
| ORANGE ★ France, Europe | 1.5°C | - | COMMITTED | Company | |
| Date published/updated 2021 | Target summary Near term: 1.0°C by 2025 Net zero: Committed ★ Business Ambition for 1.5°C campaign member | | Target Orange commits to reduce absolute scope 1 and 2 GHG emissions by 20.2% by 2025 from a 2018 base year. Orange commits to reduce its scope 3 emissions 14% by 2025 from a 2018 base year. | | |
| Sector Telecommunication Services | | | | | |

| COMPANY/FINANCIAL INSTITUTION | TARGETS | | | ORGANIZATION TYPE | VIEW LESS ^ |
|---|--|-----------|----------|-------------------|-------------|
| | NEAR TERM | LONG TERM | NET-ZERO | | |
| Ciena Corporation United States of America (USA), North America | COMMITTED | - | - | Company | |
| Date published/updated 2023 | Target summary Near term: Committed | | | | |
| Sector Technology Hardware and Equipment | | | | | |



BUT HOW DO WE REDUCE EMISSIONS?



Renewable
Energy



Energy
Efficiency



Remote
Work



Cable
Protection



Recycling

Should CO2 removals be used for the rest?





THERE ARE MANY EXISTING FRAMEWORKS FOR SUSTAINABILITY

ISO 14001 Standard
for Environmental
Management



TELXIUS

ciena



bulk™

Orchestrating a brighter world

wfnstrategies

NEC



Green Marine
Environmental
Certification



SS 564
Green Data
Center Standard



LEED
Green Building
Certification



ciena

Energy Star
Efficiency
Certification





BUT NONE DESIGNED FOR OUR INDUSTRY...

WHAT METRICS SHOULD BE INCLUDED FOR SUBSEA?

Metric 3: Carbon Neutral and Renewable Energy Usage



- **3.1.** Percentage of power supplied by carbon neutral/renewable energy

Bottom Line: Sustainable companies reduce emissions through purchasing or installing carbon neutral energy at the CLS, office, or factory



Metric 3: Carbon Neutral and Renewable Energy Usage



Leading By Example:

- **Aqua Comms:** Renewable energy powered in many locations
- **ASN:** Solar power at facilities and in some CLS
- **BT:** Network powered by 100% renewable
- **Bulk Infrastructure:** Renewable powered CLS (hydropower)
- **Ciena:** Many offices operating on renewable energy. Solar plant at Gurugram, India office
- **HMB-IX:** Worked with community partners toward local solar installation
- **NEC:** Solar power at facilities
- **NJFX:** Carbon neutral power
- **Orange Marine:** Solar panel for providing electricity to their cableship in their La Seyne-sur-Mer marine base
- **Southern Cross Cable:** Renewable power in many CLS
- **Telecom Egypt:** Solar powered installations

Metric 3: Renewable Energy Usage



Existing Framework: RE100

– Commitment to 100% renewable energy



Metric 4: Energy Efficient Buildings



- 4.1. PUE: Power Usage Effectiveness

$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

| PUE | DCiE | Level of Efficiency |
|-----|------|---------------------|
| 3.0 | 33% | Very Inefficient |
| 2.5 | 40% | Inefficient |
| 2.0 | 50% | Average |
| 1.5 | 67% | Efficient |
| 1.2 | 83% | Very Efficient |

Bottom Line: PUE may be used for CLS, but there are limitations to this metric

Metric 5: Energy Efficient Ships and Marine Technology



- **5.1.** Calculate Energy Efficiency Operational Indicator (EEOI)
 - Existing International Maritime Organization (IMO) monitoring tool
 - Indicator = $MCO_2 / (\text{transport work})$
 - Transport work is ***not specific to cable industry***
- **5.2.** Improve EEOI year-on-year

For Debate: The IMO has already developed metrics for energy efficiency. The Ship Energy Efficiency Management Plan (SEEMP) is required for many ships. Do we need a cable-ship specific metric? Do we need to align the emission factors used?

Bottom Line: Many ships are already engaged in efficiency measures: it's « common sense », but these measures are not shared or evaluated.

Metric 6: Speed Optimization



- **6.1.** Run ships at optimal speed for fuel efficiency

For Debate: Should running at optimal speed for efficiency be written into contracts?

Bottom Line: Will customers pay?



Metrics 4, 5 & 6: Efficiency Measures



Leading By Example

- **ASN:** Energy efficient factories. Reused energy of manufacturing process to heat the office.
- **BT:** Efficiency improvements made at cable landing stations
- **Global Marine & IT International Telecom:** Energy efficiency projects onboard and shoreside
- **R&G Telecom:** Consultants for energy efficiency projects at CLS
- **Solomon Islands Submarine Cable Company:** Developed an internal plan to act responsibly and save energy
- **Southern Cross Cable:** actively switching to LED lighting in CLS and Corporate locations
- **Telxius:** Energy efficiency projects in 13 CLS



Metric 7: Remote Work



- **7.1.** Company commits to a % of remote meetings
- **7.2.** Company commits to carbon removal credits for remaining travel
 - Our research shows that travel is essential to the subsea cable industry
 - Need to maintain some in-person element to establish global networks
 - We have developed a calculator to estimate carbon savings of going remote

For Debate: Many companies are already doing this: do we need a metric? If so, what is the best way to quantify savings by remote work?



Leading By Example

- **ASN:** Implementation of SMART Glasses: Remote support and training ensuring secure communication and remote FAT
- **Ciena:** Used carbon offsets to remove CO2 in equivalent to business travel. Remote provisioning and diagnostics of SLTE
- **Southern Cross Cable:** Company policy for all travel to use carbon offset credits & carbon neutral ground transportation

Metric 8: Subsea Cable Protection



- **8.1. Protect cables**

- More repairs = More fuel burned
- A well-protected cable leads to fewer repairs and less CO2 emitted
- Armor is a crucial component of cable protection, yet it is a substantial contributor to the cable's carbon footprint
- Burial and Rock Placement?

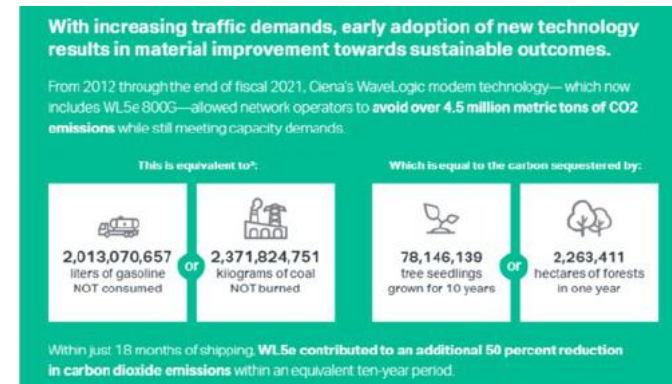
For Debate: Is it possible to evaluate the sustainability of cable protection?



Metric 9: The Subsea Cable Emissions Index (SCEI)



- **9.1.** CO₂e/km/max data capacity/expected lifetime
 - An original metric for subsea cable emissions
 - Upgrading would increase max data capacity



Graphic courtesy of Ciena

For Debate: Should carbon emitted during installation be averaged over a 25 yr life or a 13 yr life? Should we use power/bit given how dramatically bits are growing?

Bottom Line: An original metric for subsea cable emissions would help to set baselines, targets, and benchmarks

Leading By Example:

ASN was the first to develop and implement the Spatial Division Multiplexing (SDM) delivering greater power efficiency per bit with - 70% reduction in power per bit



Metric 10: Recovery, Recycling, and Circular Economy



- **10.1.** A sustainable cable includes a contract for the recovery and recycling of cable at its end of life
 - The emissions saved by re-using cable materials far exceeds that emitted by the current cable recovery ships dedicated to recycling
 - Recycling cable is less carbon intensive than production from virgin feedstock

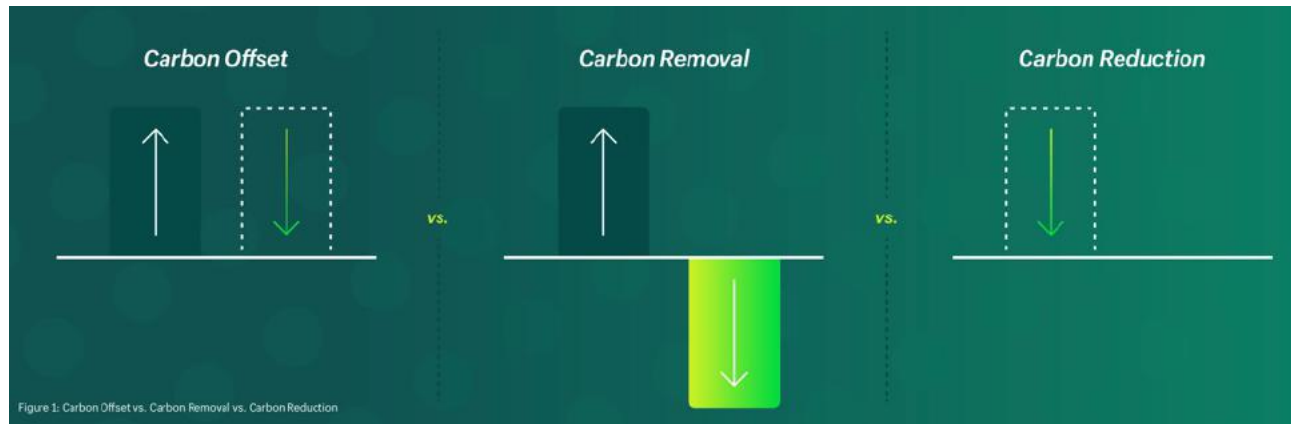
For Debate: Does percentage of cable matter? Which segments are viable for recovery? Should permitting be aligned? What about equipment and facilities?

Bottom Line: Our carbon footprint shows that recovery and recycling is a net carbon negative operation

CO2 Removals to get to net-zero?



- Not all emissions can be eliminated...
- **What happens with the emissions left?**
 - Many CO2 offset schemes are « *worthless* »
 - **CO2 removal** projects are better.





- « When you buy an **offset**, you pay someone else to not emit carbon dioxide (CO2). If you've emitted one tonne of CO2 and bought one tonne of offsets, less CO2 is getting released, but your one tonne is still up in the atmosphere, and will stay up there for a long time. While offsets carry a climate benefit in theory, **the majority are generated from questionable projects** »

- "When you buy a **carbon removal credit**, you pay someone to pull carbon dioxide out of the atmosphere and to store it outside of the atmosphere...If you've emitted one tonne of CO2 and you've bought one tonne of carbon removal, you've broken even because the equivalent amount to your one tonne of CO2 has been pulled back out of the atmosphere."

Bottom Line: CO2 removals can and should be used to help companies to reach net zero

See here for more info: <https://cdn.shopify.com/static/sustainability/Shopify-Carbon-Removal-Buying-Guide.pdf>

QUESTIONS FOR DISCUSSION



- **How can we harmonize these metrics?**
- **What should be done with these metrics?**
 - Some paths forward:
 - Develop a certification scheme for sustainability?
 - Publish for adoption? Who should publish? SubOptic?
 - Establish optional standards via the ISO or ITU?
- **Should there be a mechanism for compliance? Or should progress be governed by companies internally?**
- **We are writing for another grant from the Internet Society Foundation. What next step would you like to see us take?**

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