HEXATRONIC

Unrepeatered systems – why, what, when?

Submarine Networks World 2020

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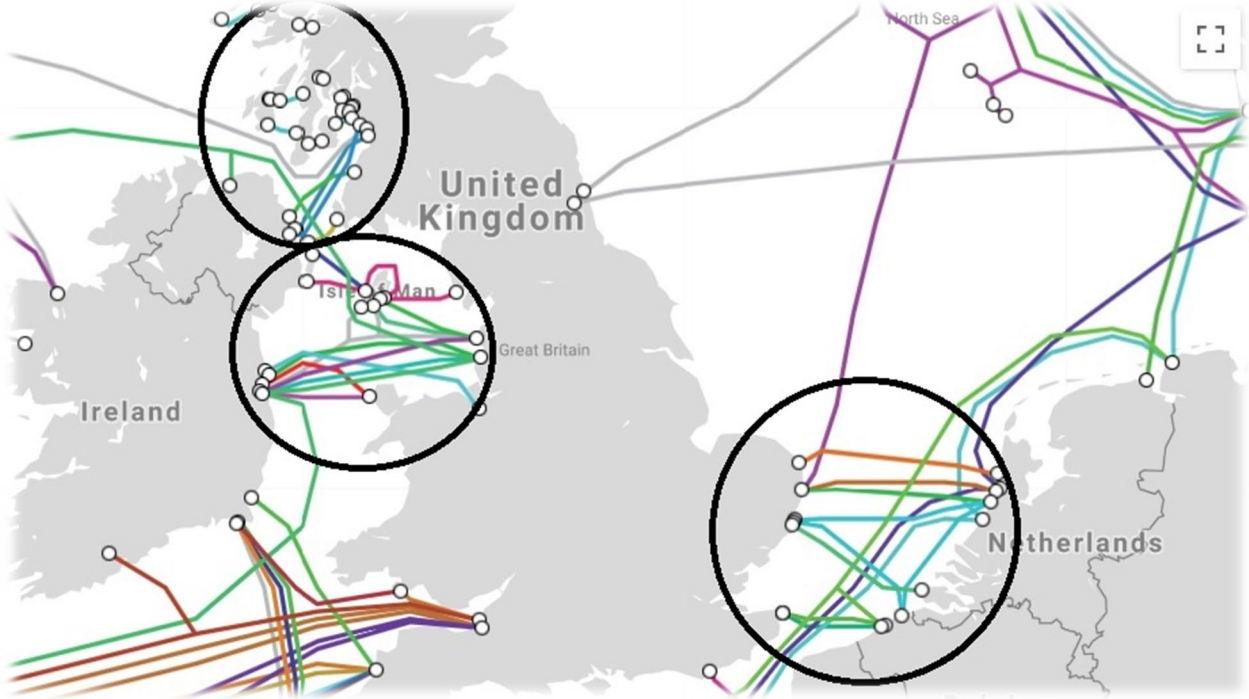
submarine telecoms FORUM

SUBMARINE NETWORKS WORLD 2020

When are unrepeatered systems deployed?

- Short point-to-point links between countries, regions & islands
- To provide telecoms connectivity to an oil platform, off-shore wind facility, etc.
- Where a festoon system makes better economic sense than a terrestrial one
- To increase local connectivity to a trans-oceanic cable system
- As an outrider or integral part of a power cable
- To cross harbours, rivers and lakes



Power to the unpowered!

- The unrepeatered market is not very well represented within the subsea community
  - ✓ Lack of data recorded and reported. Hard to come by regional data, pricing and statistics
  - ✓ Lack of debate or discussion – new customers do not have a very clear idea about the unrepeatered solutions available to them
  - ✓ Lack of information leads to missed opportunities in our industry and in others. More expensive, non-optimal solutions being considered

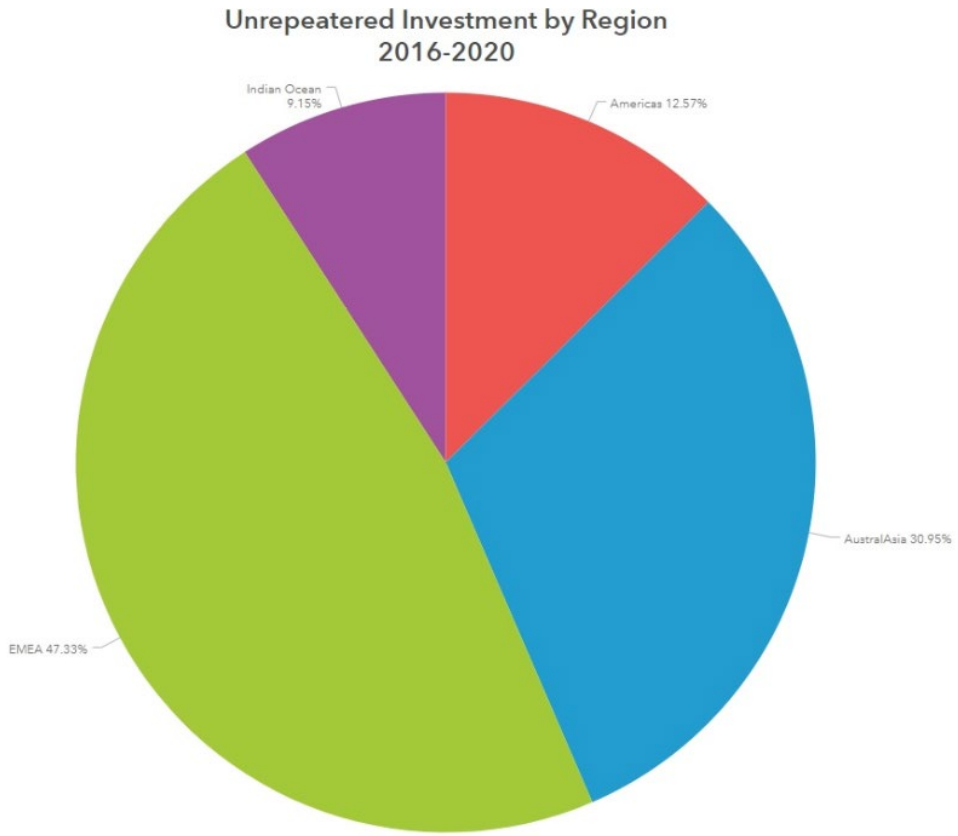
- Increased conference participation by the unrepeatered suppliers
- Better access to data – analysts to include unrepeatered market – STF currently performing a study
- Better communication on technology and developments of unrepeatered systems

Unrepeatered Market

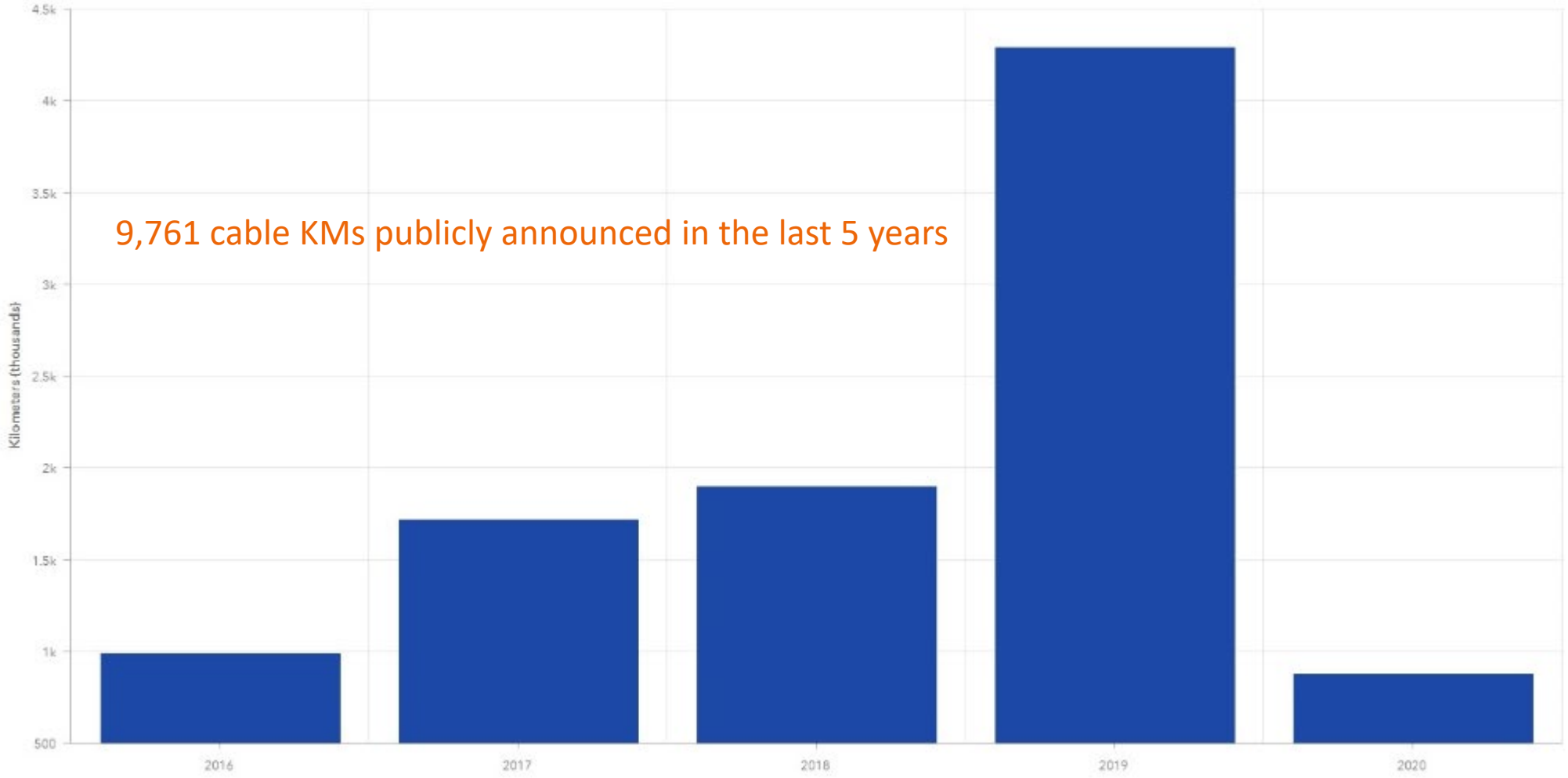
2020/2021

Recent market updates – courtesy of Submarine Telecoms Forum

- 33 publicly announced unrepeatered systems put into service 2016-2020
  - ✓2019 was particularly busy for new unrepeatered builds
  - ✓2020 saw a slow down presumed to be COVID related – 13 were published as planned for 2020 but will likely go RFS in 2021
  - ✓Many unrepeatered systems are not announced, particularly in the special markets
- Over the past 5 years, publicly announced unrepeatered systems were responsible for $370 million investment, averaging $73M a year
  - ✓Primarily in the EMEA region (47%), followed by AustralAsia (31%) and the Americas (13%)



Unrepeatered cable KMs per year – publicly announced



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Hexatronic's Unrepeatered footprint

- Angola
- Australia
- Bahrain
- Ghana
- Iceland
- Japan
- Korea
- Lake Ontario (USA – Canada)
- New Zealand
- Nigeria
- Norway
- Saudi
- Sweden
- Thailand
- The Adriatic
- The Baltic Sea
- The Caribbean
- The North Sea
- The Philippines
- The USA
- Various oil platforms

Pros and Cons of Unrepeatered Systems

Pros

- Passive technology, no complex powering required*
- High fibre count – 192 fibres and more
  - ✓Simple fibre pair sale business model
- Abundance of supply, quick manufacturing lead times
- Inexpensive solution (no repeaters, PFE, supervisory)
- Simple disaggregated solutions – cable / vessels / transmission

Cons

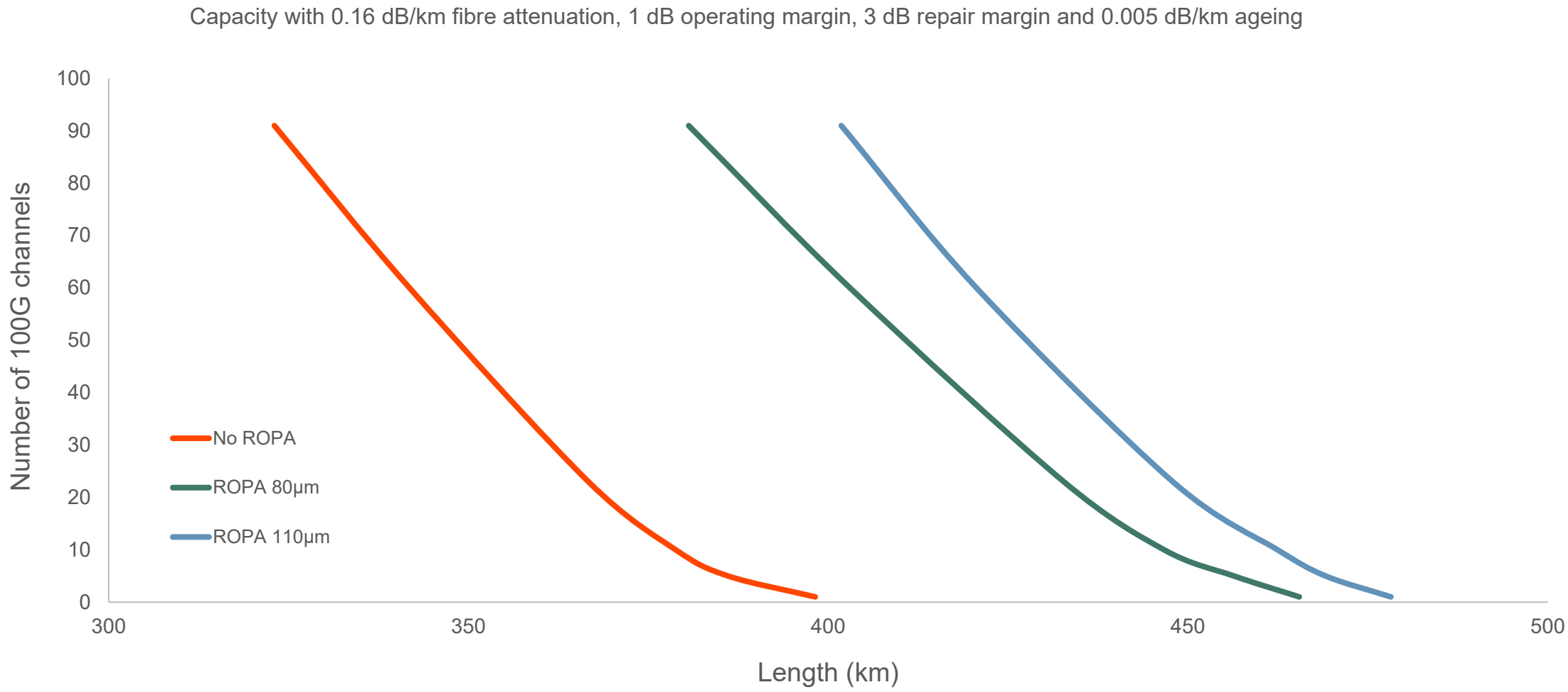
- Distance limited
- As unrepeatered spans get longer more expensive fibre is required
- Longer spans require remote optically pumped amplifiers (ROPA)
- Short jobs may struggle to get the attention of survey and installation vessel operators

** Especially relevant to oil and gas platform connectivity*

To repeat or not to repeat?

- Distance constraints typically drive the choice between unrepeatered and repeatered systems
- Studies by Xtera and Hexatronic showed that currently the economic tip over point is around 450km
  - ✓ Price of fibre / cable / repeaters / ROPA / PFE all need to be considered
- SDM has meant that higher fiber count repeatered systems are now a viable option (8, 16, 32 fibres pairs…)
  - ✓ This has resulted in more accessibility of fibre pair ownership on repeatered systems
- Current trend of branches and stubbed BU's being designed into new systems along main traffic routes
  - ✓ Makes sense when you are passing a location on your planned trunk route
  - ✓ Potentially makes less sense when the trunk landing point could be reached by an inexpensive unrepeatered hop

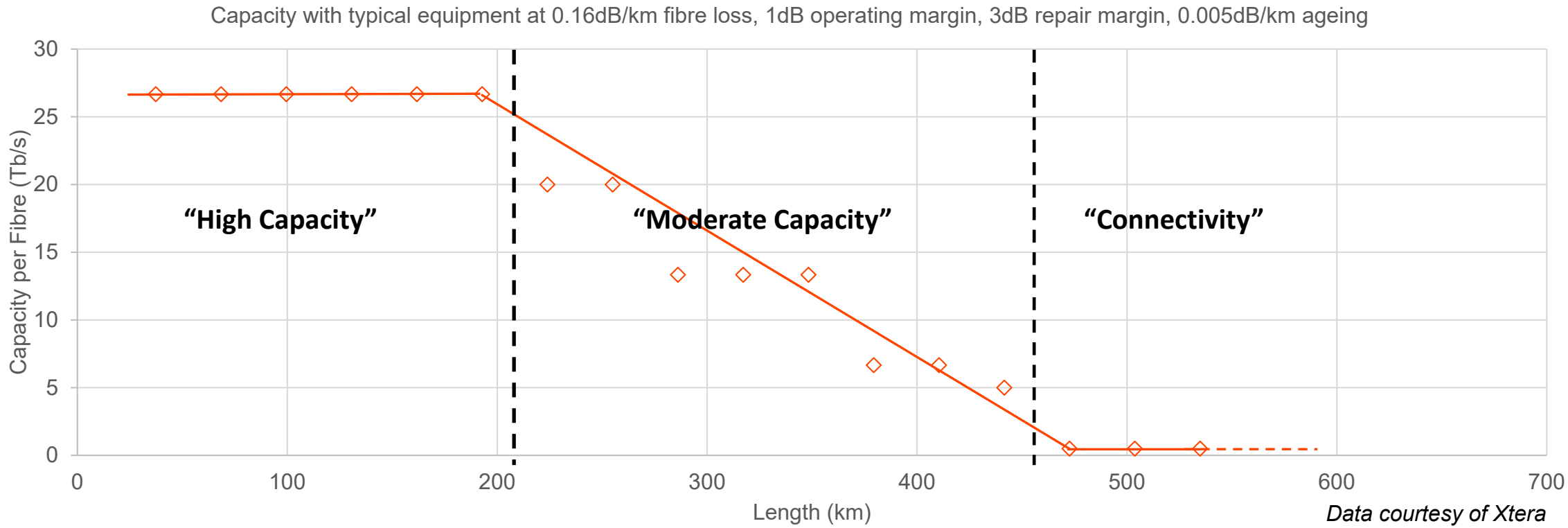
Let’s talk about distance!



Data courtesy of Xtera

The whole range - from capacity to connectivity

- Easy to achieve high capacity only over short links with almost any equipment – whilst bridging very long distances even with small capacity is hard – and costly
- What's needed depends on the application, e.g. high capacity for data centres or connectivity for small islands
- But: There is a middle range where both decent capacity and distance can be achieved by good system design



Other Markets – Living in Harmony?

- The seabed is currently occupied by
  - ✓Submarine fiber optic telecoms cables
  - ✓Submarine power cables (interconnectiors)
  - ✓Submarine power cables (export and inter array cables)
  - ✓Offshore wind farms
  - ✓Oil & Gas platforms
  - ✓Pipelines and umbilical's
  - ✓Out of service assets

- Fiber optic cables also serve many of the users outlined above – either with integrated parts or outriders
- Issues – maintenance: procedures, repair time, availability of vessels
- Requirements – better information sharing, cross-industry meetings, crossing agreement standardisation, collaborations, maintenance discussions, database (GIS)…

Unrepeatered systems – connecting the globe piece by piece

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