Communications and Power for undersea Neutrino Telescopes

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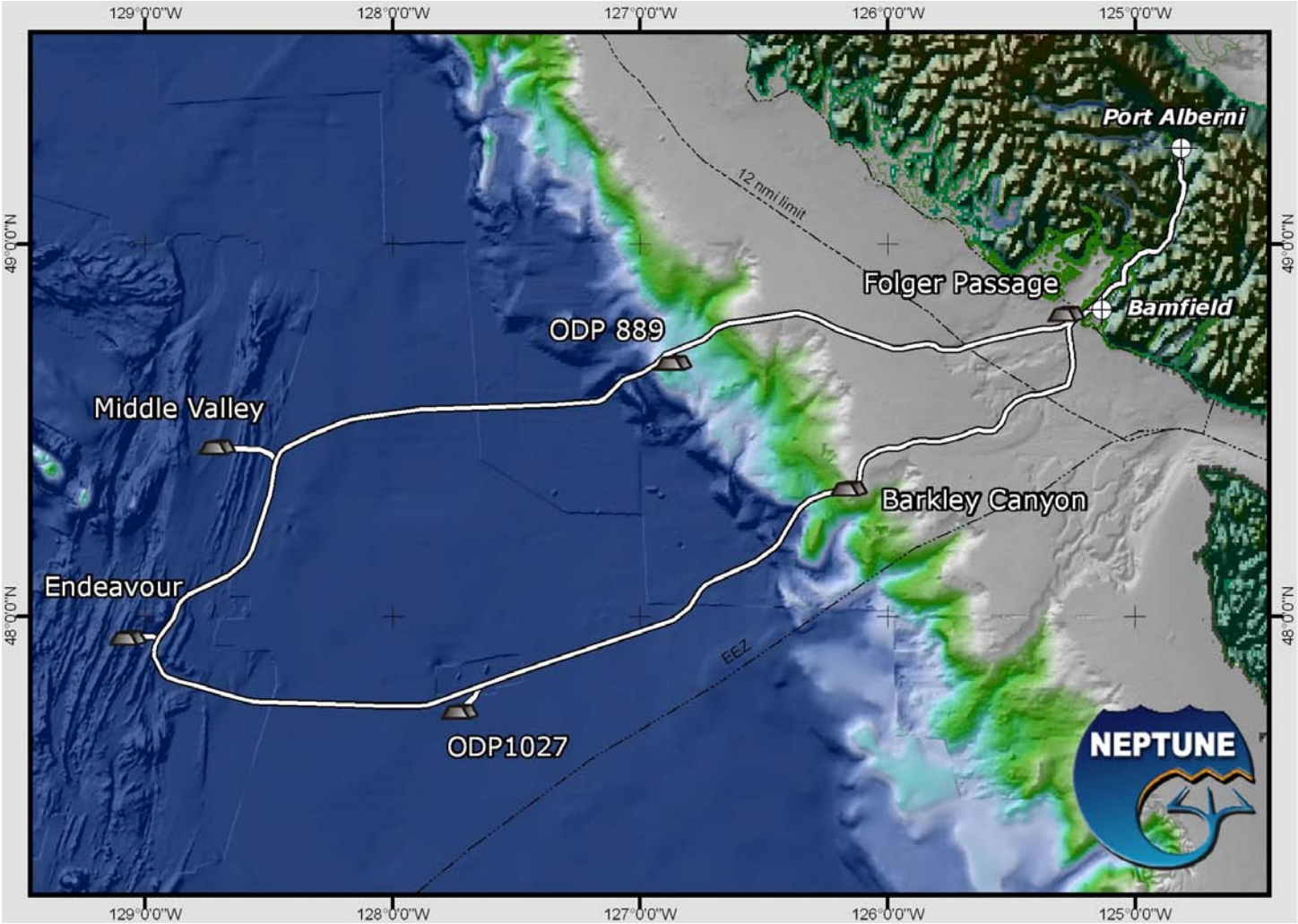
Agenda

1. System Features
2. Cable
3. Power
4. BU
5. Conclusion

Example of a Dry-Wet Application:
The NEPTUNE Canada Cable Science Observatory

- 800 km ring
- 6 Science Nodes
- Down to 3500 m



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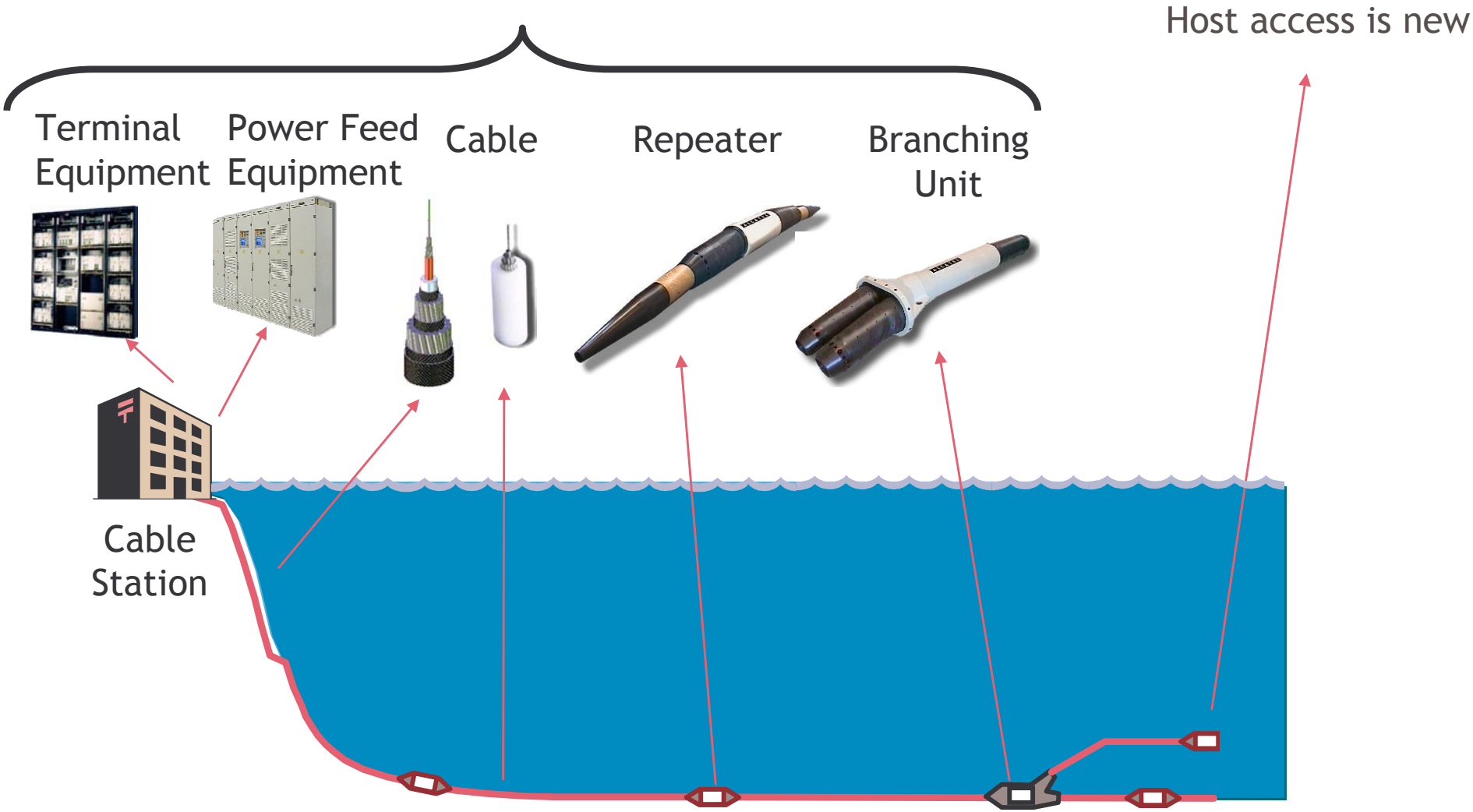
Solutions may exist for some elements of a VLVnT Communication Sub-system

- Based on Ethernet signals (bi-directional)
  - Delivery of GigE signals
  - Typically 2 protected (East-West) route per Node/Junction Box
  - May use multiple fiber pairs or multiple wavelengths (WDM) depending on distance to shore and number of nodes
- Other optical signals transport

Solutions may exist for some elements of a VLVnT
Power Sub-system

- Based on single conductor 10 kV DC solution with sea return
- Two stages:
  - MV: 10 kV to 400 V DC
  - LV: managed 400 V DC delivery
- Delivery of 10 KW per Node (per MV Converter)
  - 25 A at 400 V
- HV Switching BUs may be required if more than one Node

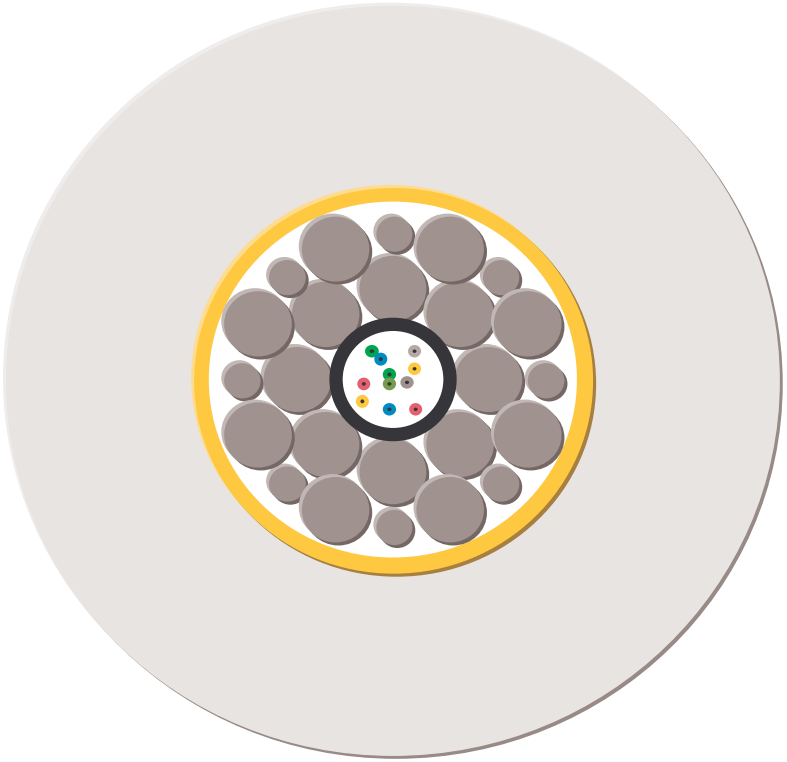
The Backbone is proven

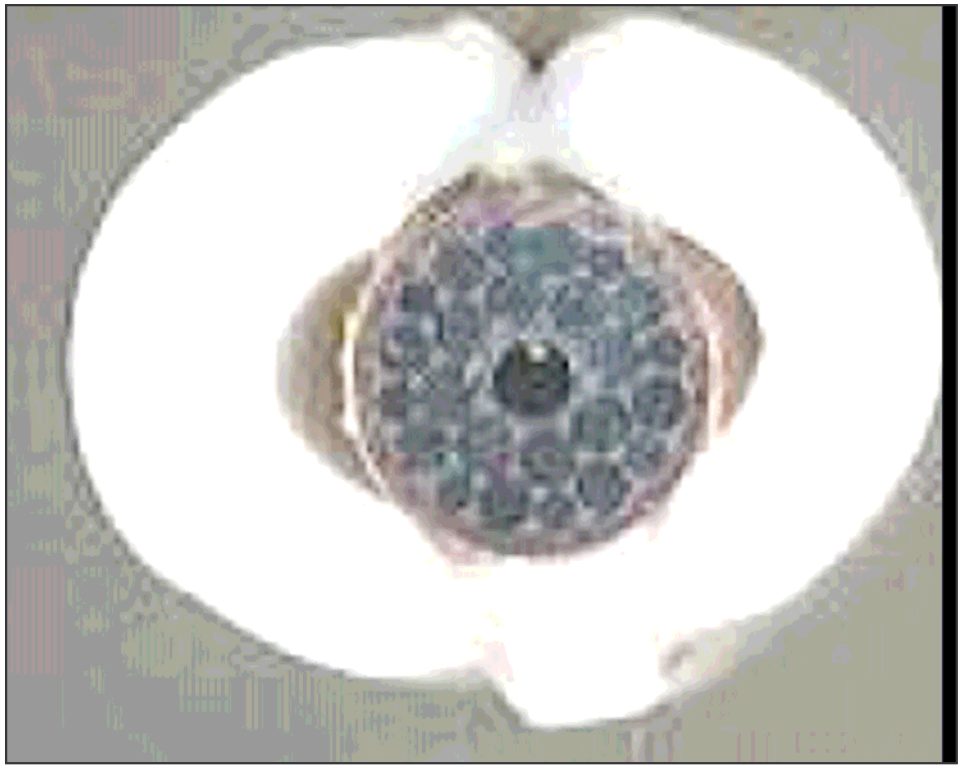


Why use a telecom submarine cable?

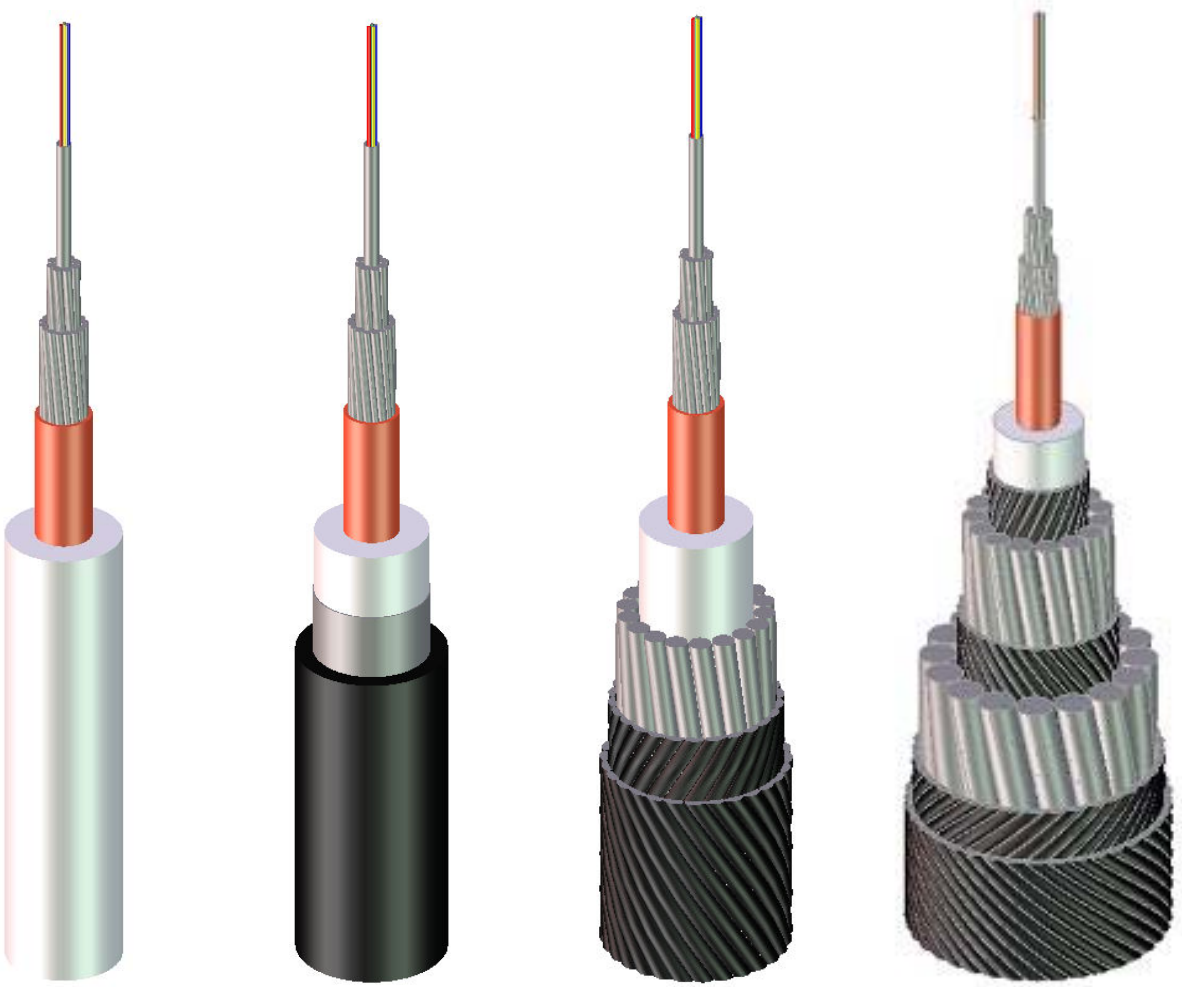
ASN Submarine cable is a field proven solution for undersea fiber protection:

- Structure is based on a vault to protect fibers against hydrostatic pressure
- Fibers are mechanically protected against tension and crush…
- Fibers are protected against hydrogen



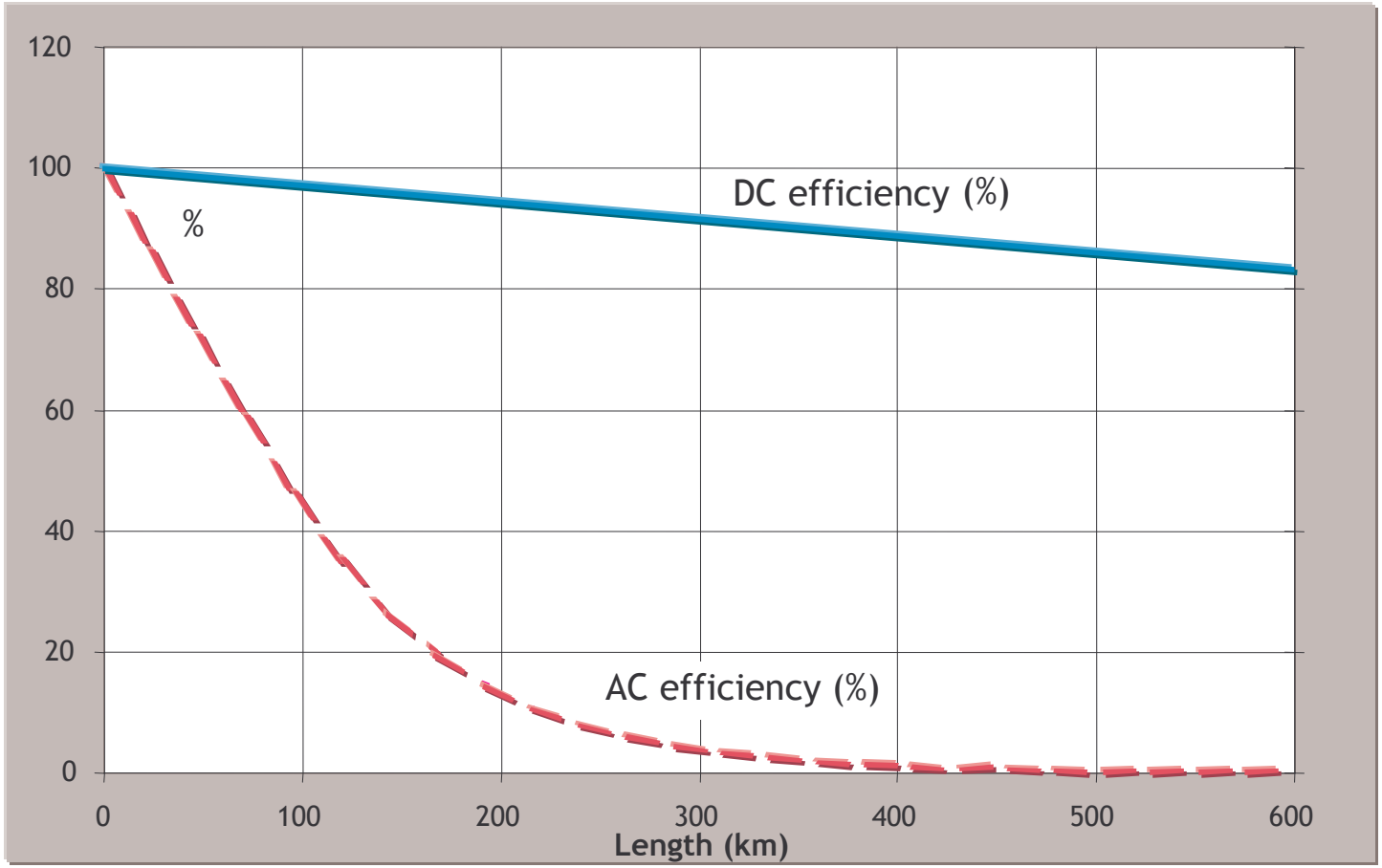


Key Element: Use of Standard Telecommunication Cable



Cost optimised and field proven for single conductor applications

DC Power Transmission Capability



DC at 10 kV

Conductor ~ 10mm^2

AC (50Hz) cable systems inefficient over ~ 100 km

DC system can efficiently deliver at 600 km

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Technology Status - Development

600 km Technology Demonstration in 2006.

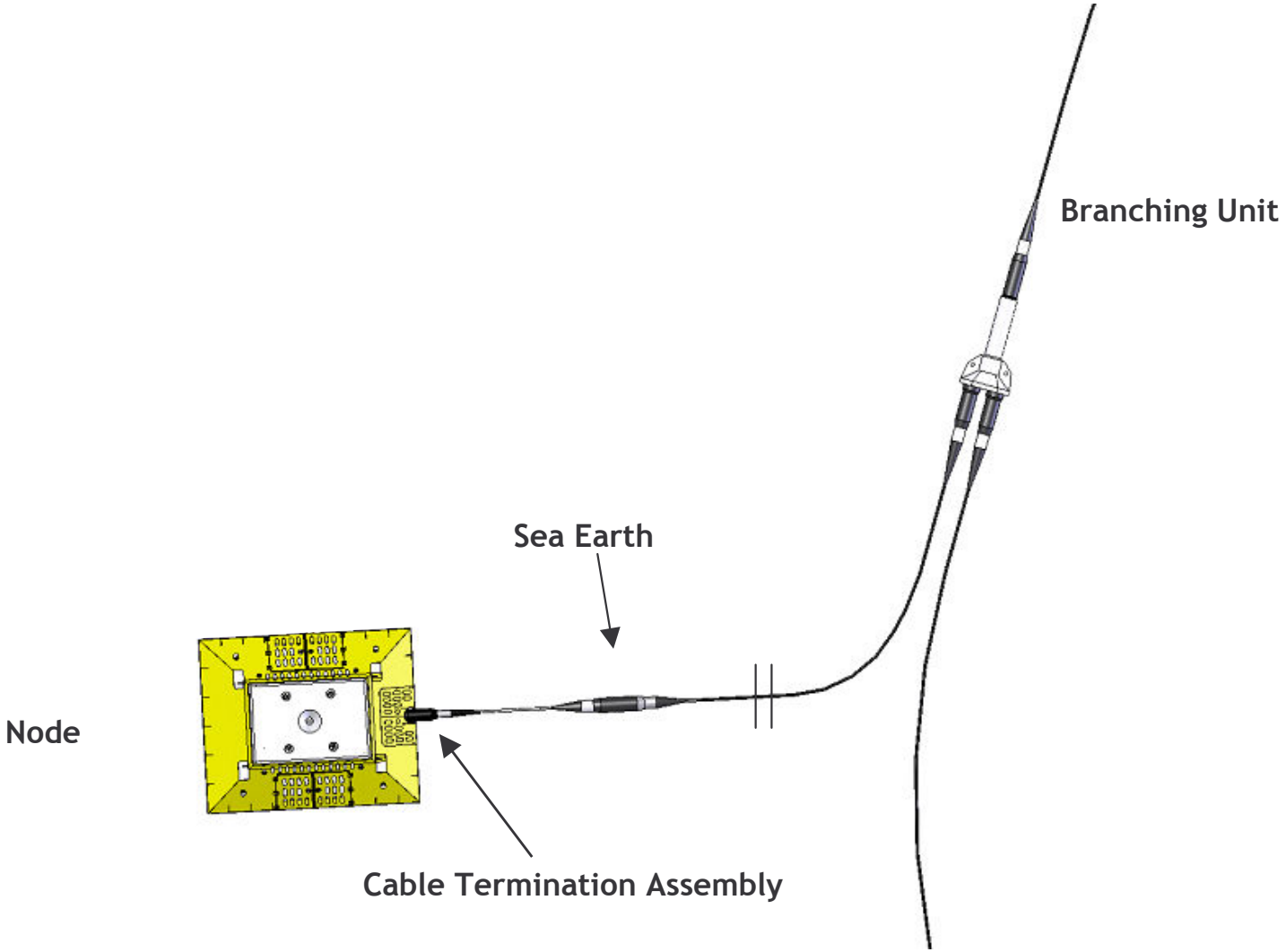
DC/DC Converter features:

- Converts 10kV DC to 400V DC, 10kW output
- Highly redundant – works even with 50% of converter modules failed

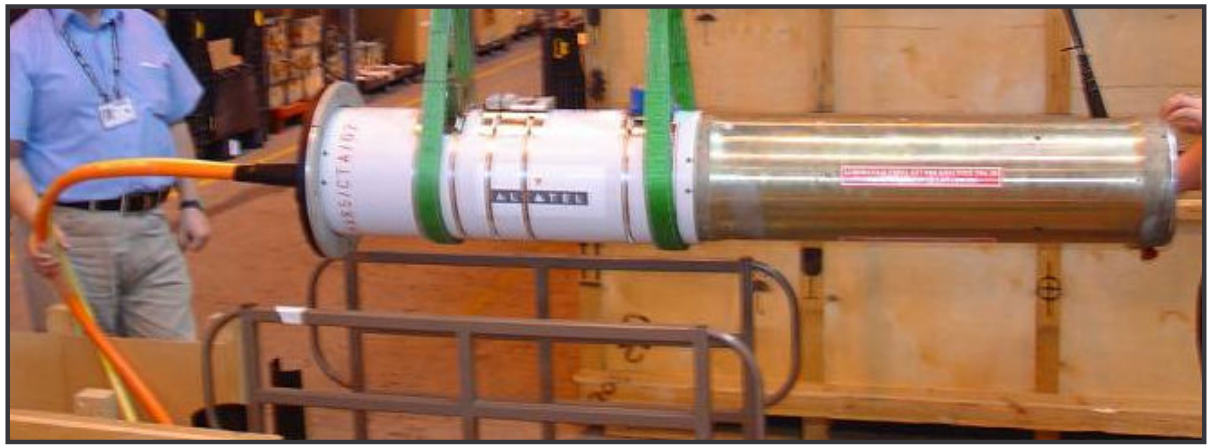
Programme status:

- Started 2005 Q4
- Prototypes complete
- First model qualified
- In service from 2008

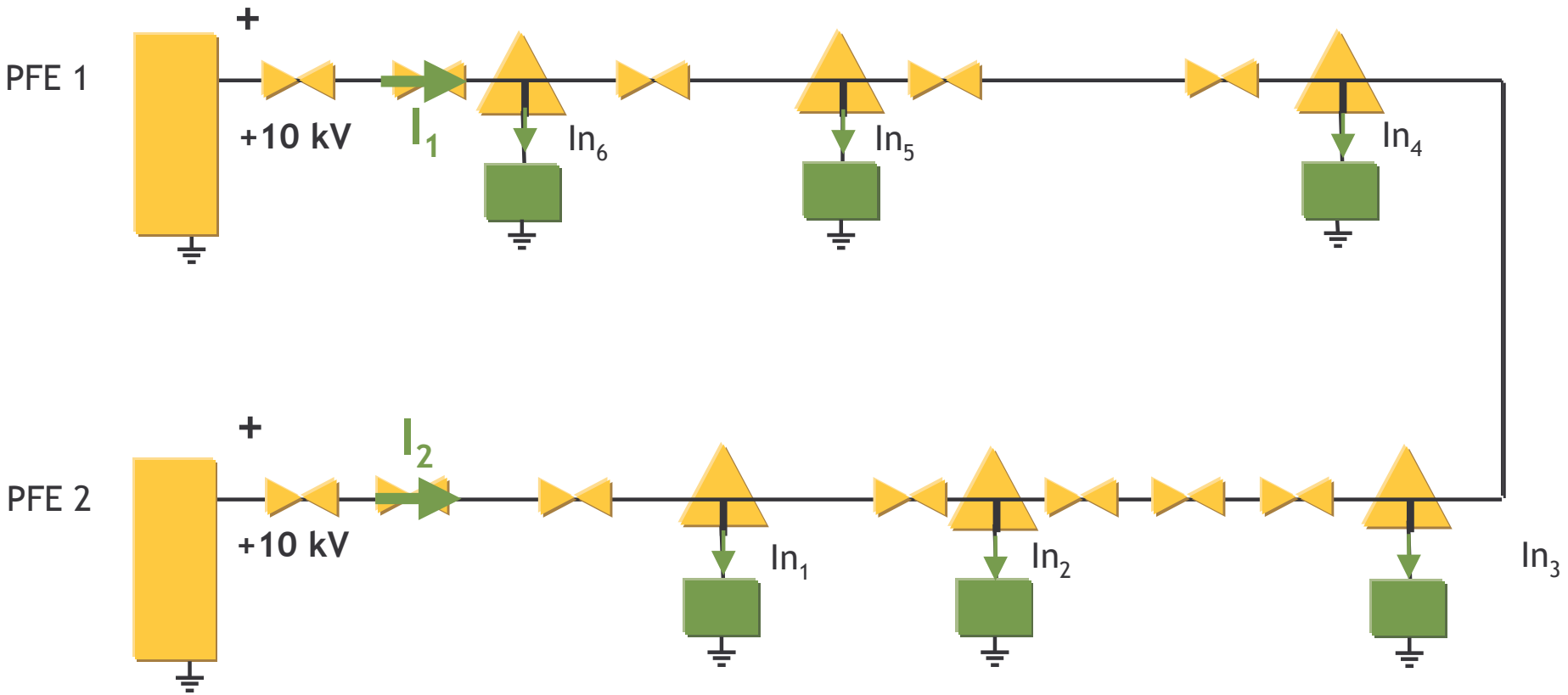
Multiple Node Branching



CTA Overview



Normal powering operation in constant voltage mode



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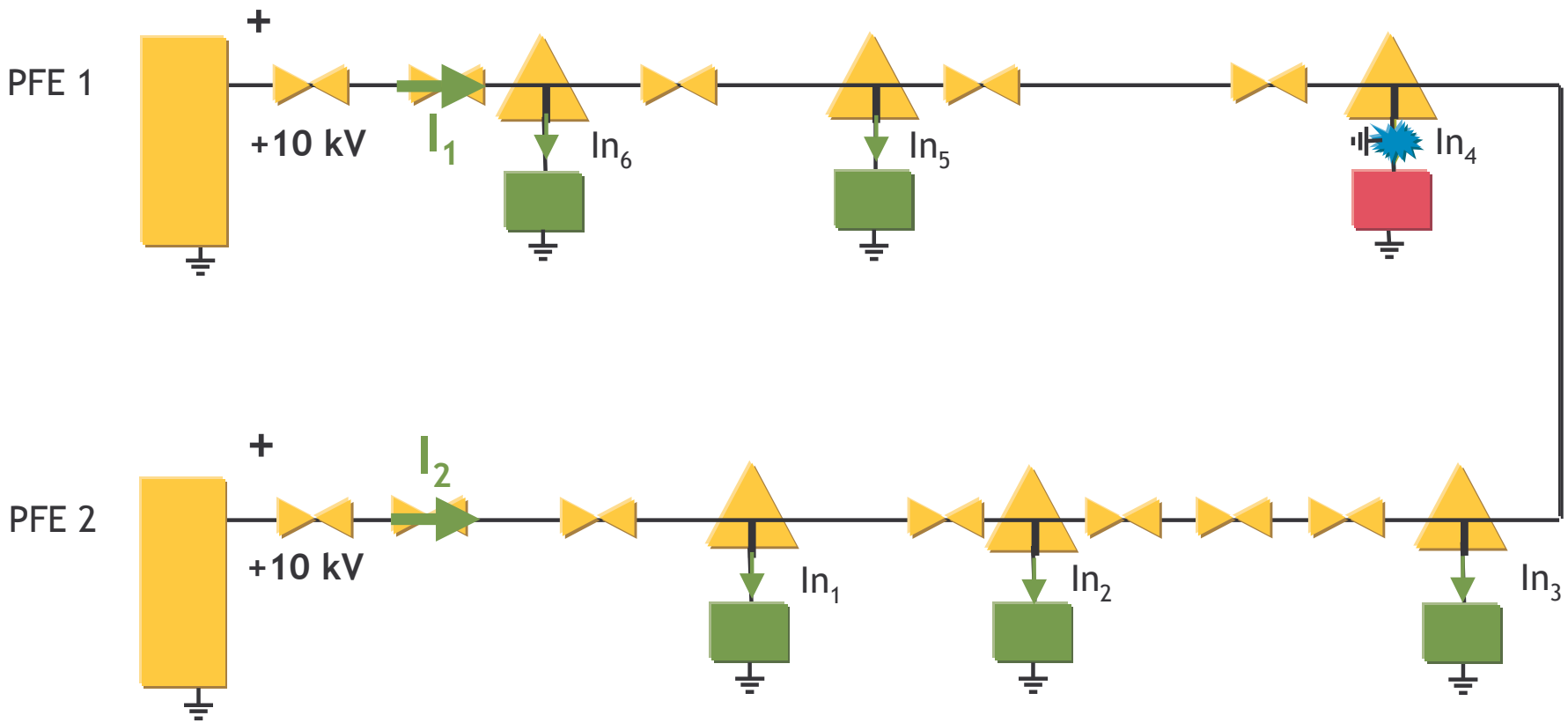
Branch cable or Node #4 fault to ground



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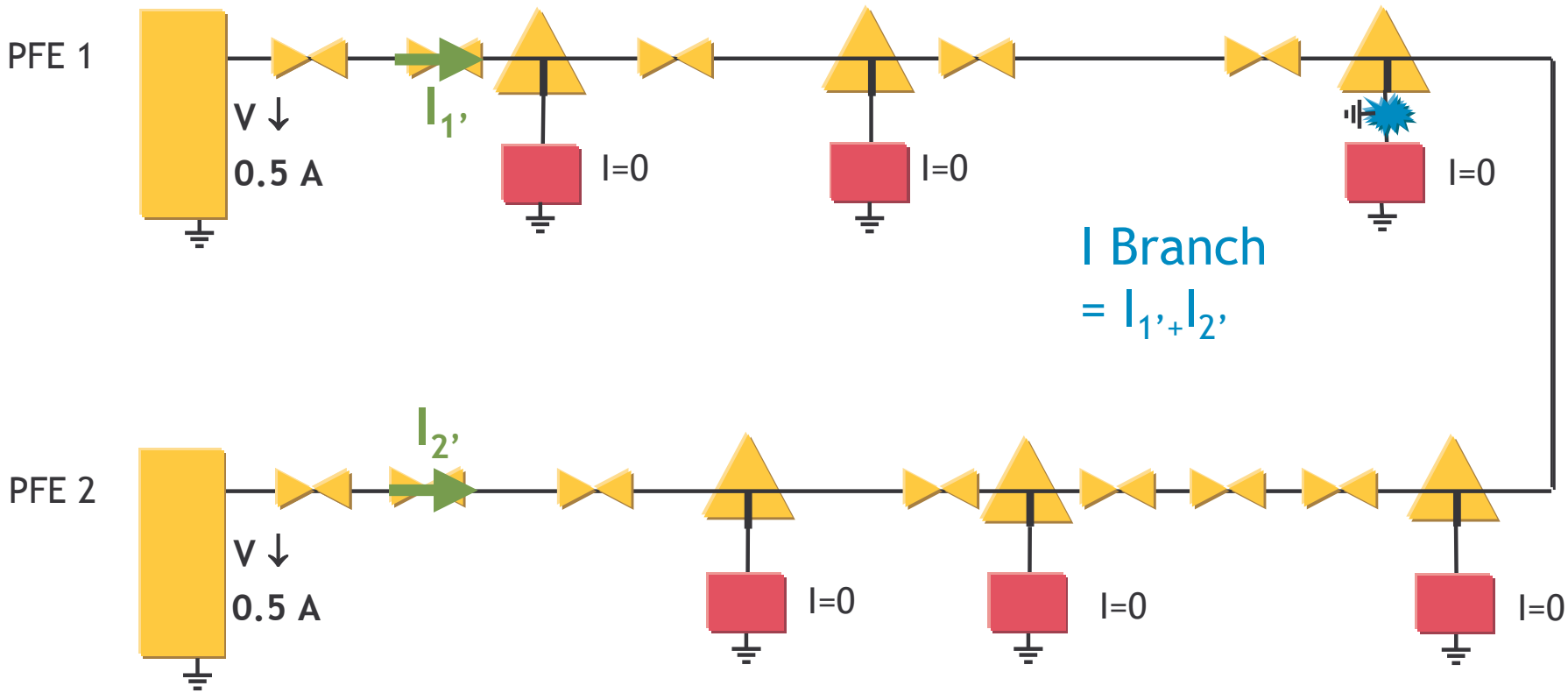
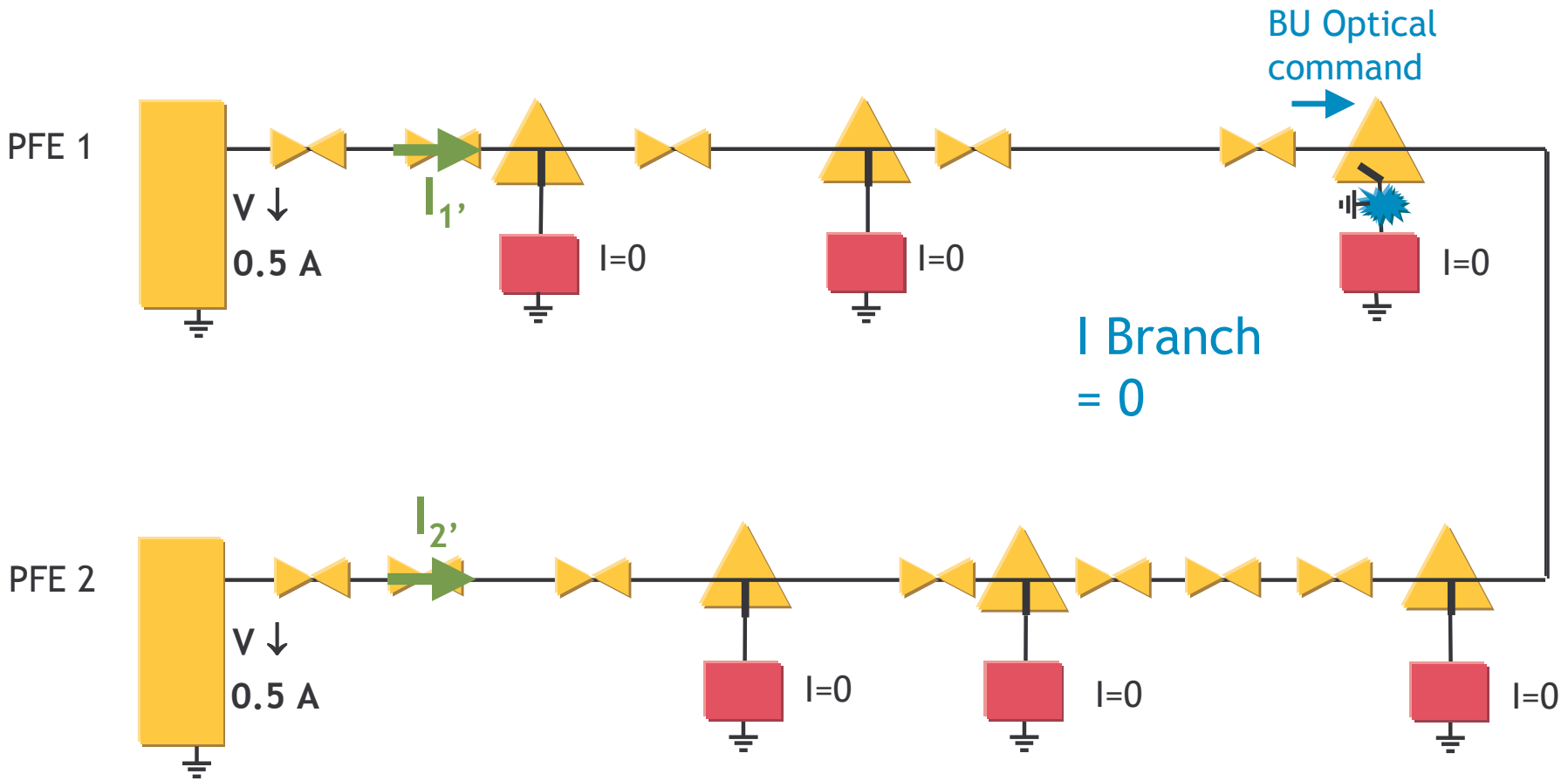
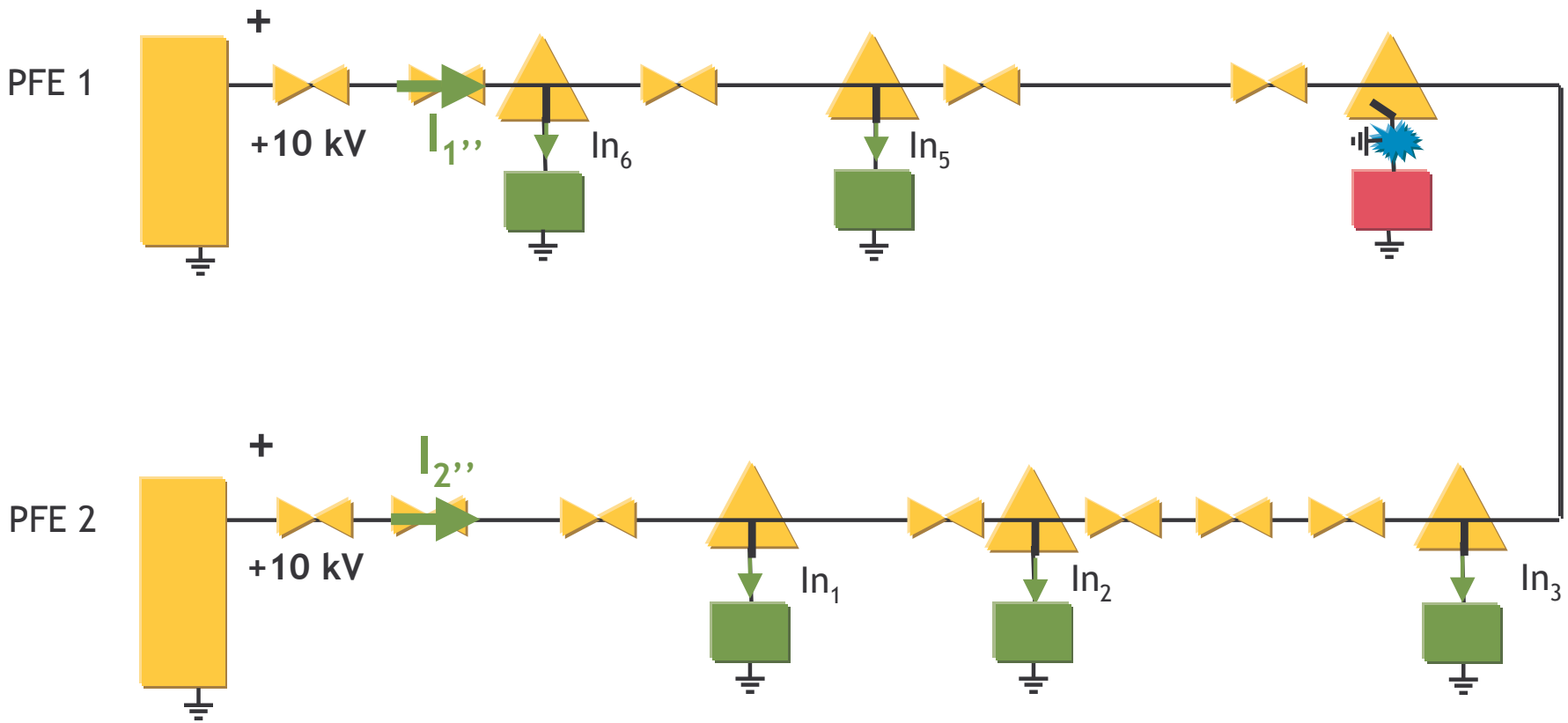
Voltage reduced by current limitation feature



Command Bu # 4 to isolate node



Remaining Nodes restarted in Constant Voltage mode



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Conclusions

Alcatel-Lucent has the required technologies to bring communication and power to sea-floor structures.

- Cable
- Wet plant
- Marine installation capabilities

Thank you

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