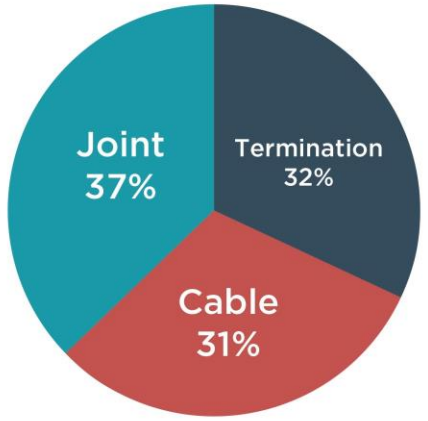
Subsea cable challenge

- Lack of asset management, condition monitoring data despite high failure rates and costs
- Conventional monitoring misses key failure modes, locations and time before failure
  - DTS $0.15-0.3M RTTR, de-burials, not applied on terminations, limited cable fault detection
  - DAS $0.15-0.3M 3rd party interference, limited cable fault detection
  - ROV $0.5-0.8M 7day survey to locate deviations, free spanning

IMPACTS	TYPICAL EXAMPLES		
ELECTRICAL	TRANSIENTS	POWER QUALITY	VARIABLE LOAD
ENVIRONMENTAL	WATER INGRESS	FLOODING	CORROSION
MECHANICAL	IMPERFECT INSTALLATION	OHMIC OVERHEATING	STRAIN

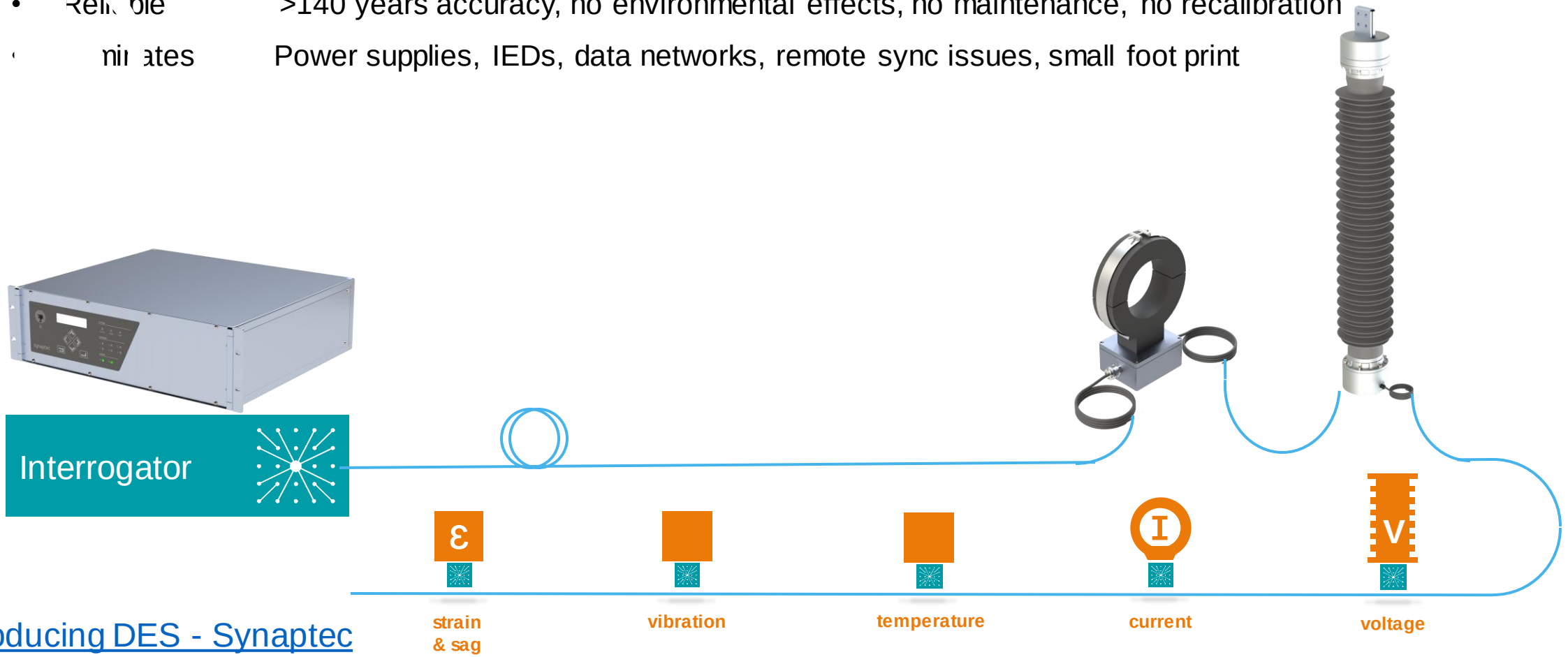


- We offer earlier failure warning and condition-based maintenance information at vital points

Source http://www.jicable.org/TOUT_JICABLE/2015_slides/2015-D9-2_slides.pdf

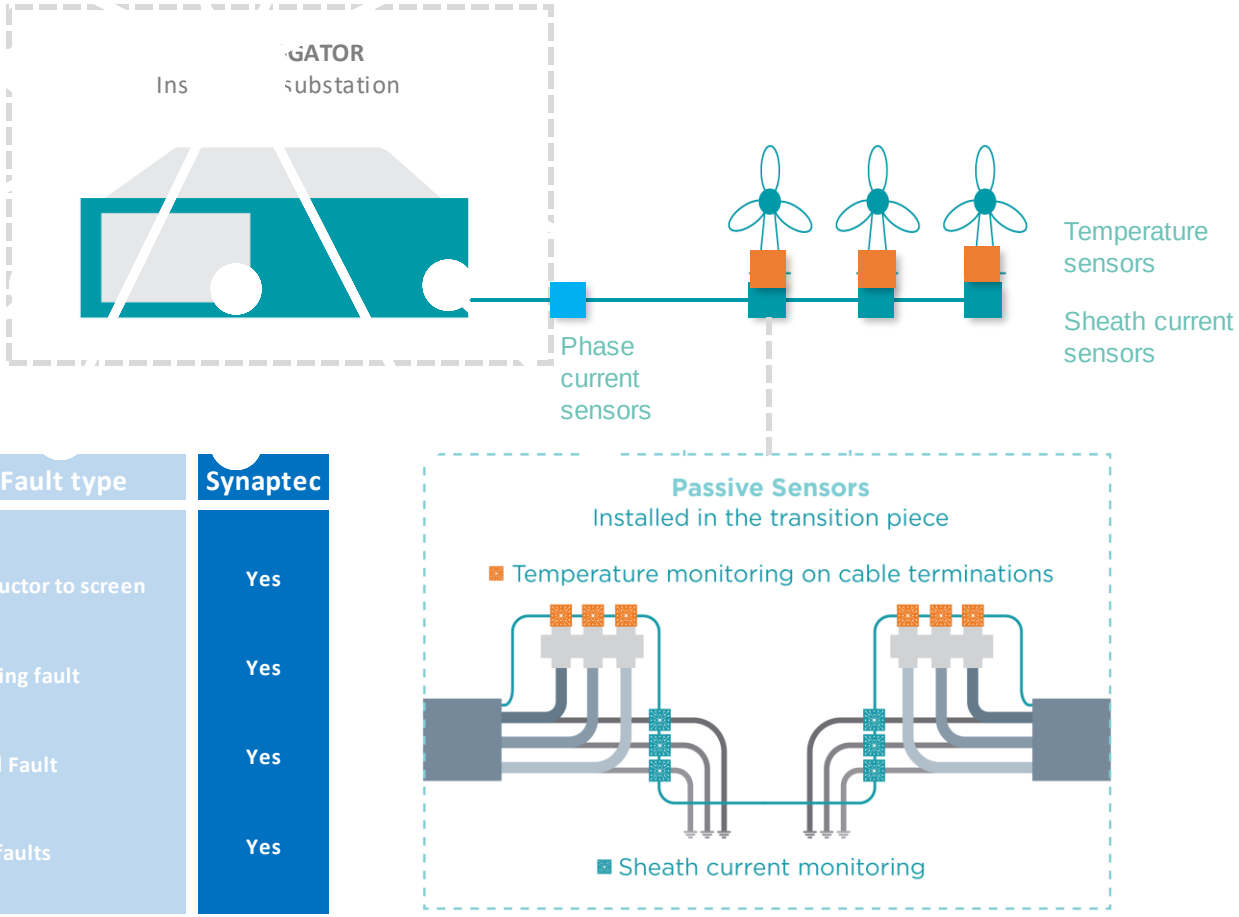
Synaptec sees more for less

- Scalable — FBG Sensors splice anywhere into fibre, in blocks of 30 sensors per 60 km of single-ended fibre
- Familiar — CTs and VTs but fully passive. No local power or data comms electronic hardware
- Retrofittable — By either using split-core CTs or secondary connect to existing CT/VT infrastructure
- Reliable — >140 years accuracy, no environmental effects, no maintenance, no recalibration
- Eliminates — Power supplies, IEDs, data networks, remote sync issues, small foot print

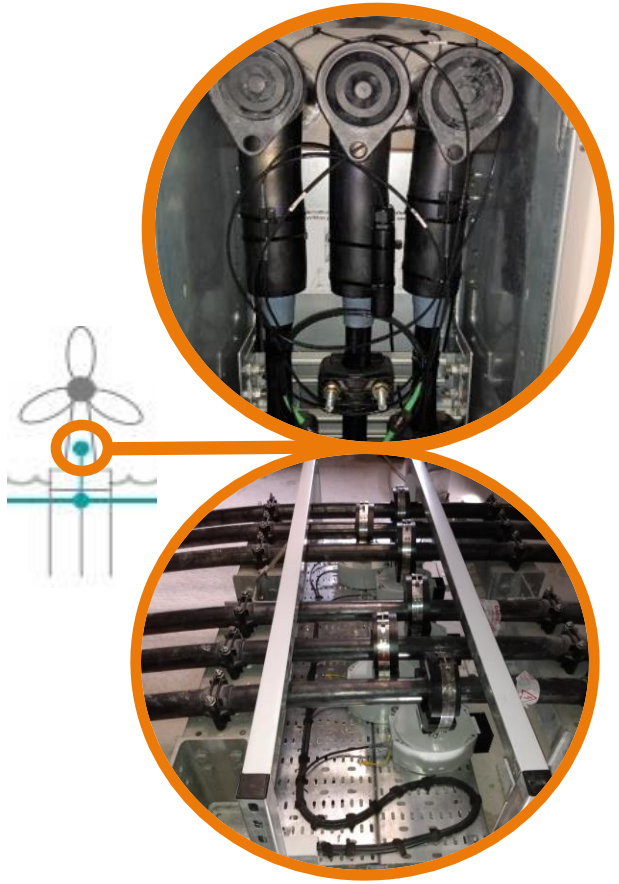


[Introducing DES - Synaptec]

Cable condition monitoring



Fault type	Synaptec
Conductor to screen	Yes
Flashing fault	Yes
Serial Fault	Yes
Wet faults	Yes

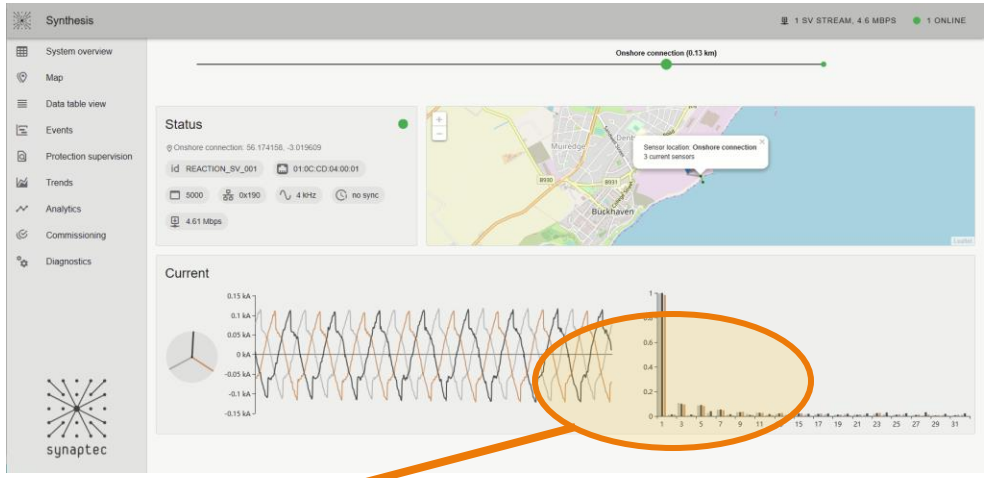


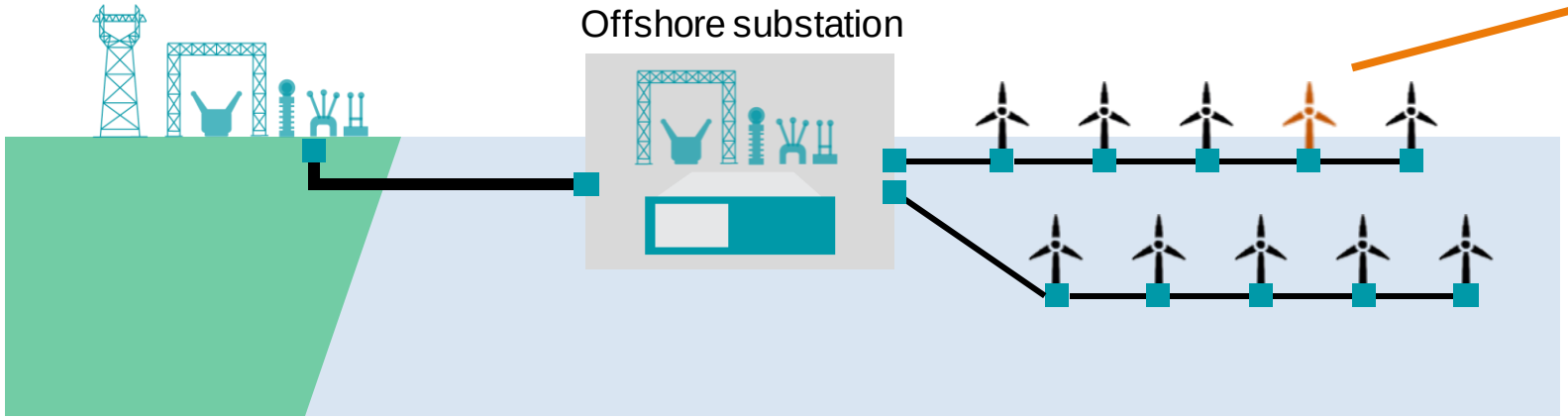
- Instant ohmic overheating alarms
- More accurate RTTR modelling
- Earlier warning of more electrical faults
- New CBM and asset management information

Distributed Power Harmonics monitoring

Asset management

- PQ at grid connection aggregated and aliased
- We see harmonics to 100th, from every WTG on each cable
- Benchmarking similar assets to drive maintenance
- Synchronous and permanent monitoring to eliminate harmful harmonic effects at source





Summary

- Transmission-grade instrumentation
- Scalable, retrofittable, passive
- Zero power, zero comms, zero maintenance
- Earlier warning of more failure modes
- Cost effective solution by reduction of ROV inspections

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Asset management

Real-time monitoring

Time-critical control and protection