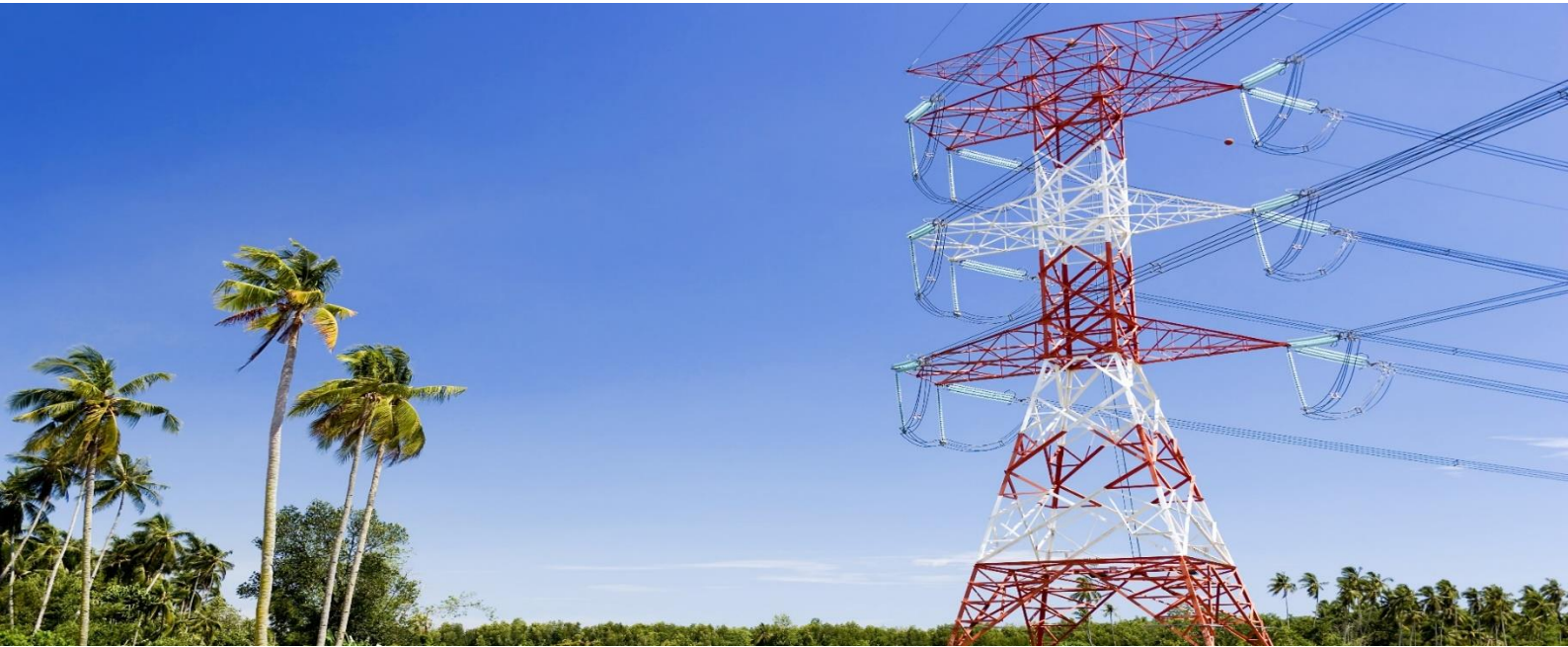


## ASIAN UTILITY TRANSMISSION TOWER DAS Intrusion Detection System (IDS)



### **THE SCENARIO**

The client is a leading state-owned utility based in Asia responsible for electric power generation and transmission for the whole country as well as bulk electric energy sales. Owning and operating power plants of different types and sizes which are in 45 sites across the country with a total installed capacity of greater than 15,000MW.

Amongst these assets includes a high voltage transmission network which forms part of the nation's critical infrastructure. As part of a safety review the client desired to increase the security of its assets through using the latest in security monitoring solutions. One of the technologies the utility assess was fiber optic distributed acoustic sensors.



## CLIENT REQUIREMENTS

The main threat that the client was looking to mitigate against was sabotage of the towers. There were potential terrorist threats in the region and protecting critical infrastructure was one of the key concerns. Of particular concern to the operator were intruders hammering, sawing, grinding or weakening the structure in any way.



Figure 1 Personnel on tower and in control room

## WHAT DID WE DO?

Innovative Energy and Bandweaver worked with the customer to implement Bandweaver's Horizon Distributed Acoustic Sensing (DAS) system to detect intrusion events. There was already a fiber optic cable installed in the ground wire. This enabled the Horizon DAS to be simply retrofitted to the transmission network without any additional sensing cable installation. Once connected, any vibrations in the transmission towers would then be transmitted to the ground wire and measured by the Horizon DAS.

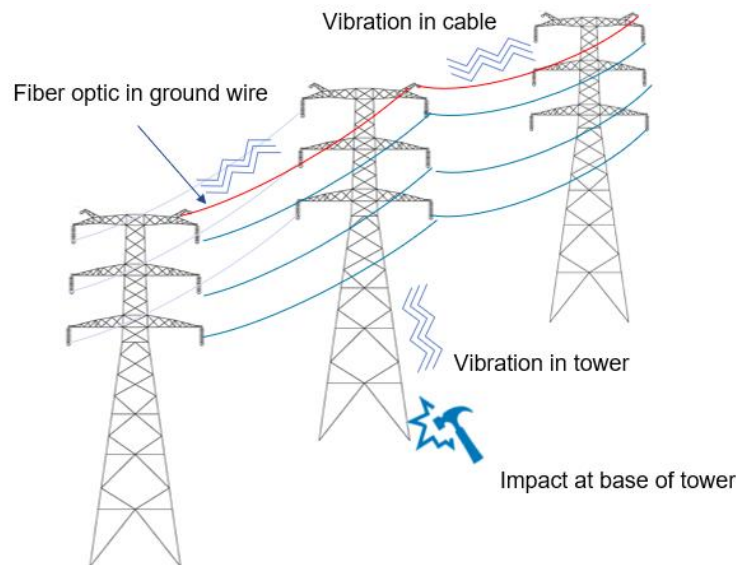


Figure 2 Principle of measurement





The operator then proceeded to carry out a number of tests on the transmission towers to simulate intruder activity.

The first test was to monitor hammering of the tower at the base. As shown below, there was a very pronounced signal, which was clearly visible on the DAS. The system is very sensitive, and these vibrations can be detected over a length of 500m. However, where the peak of the energy is located can also be clearly seen and so the specific tower is easily identified.

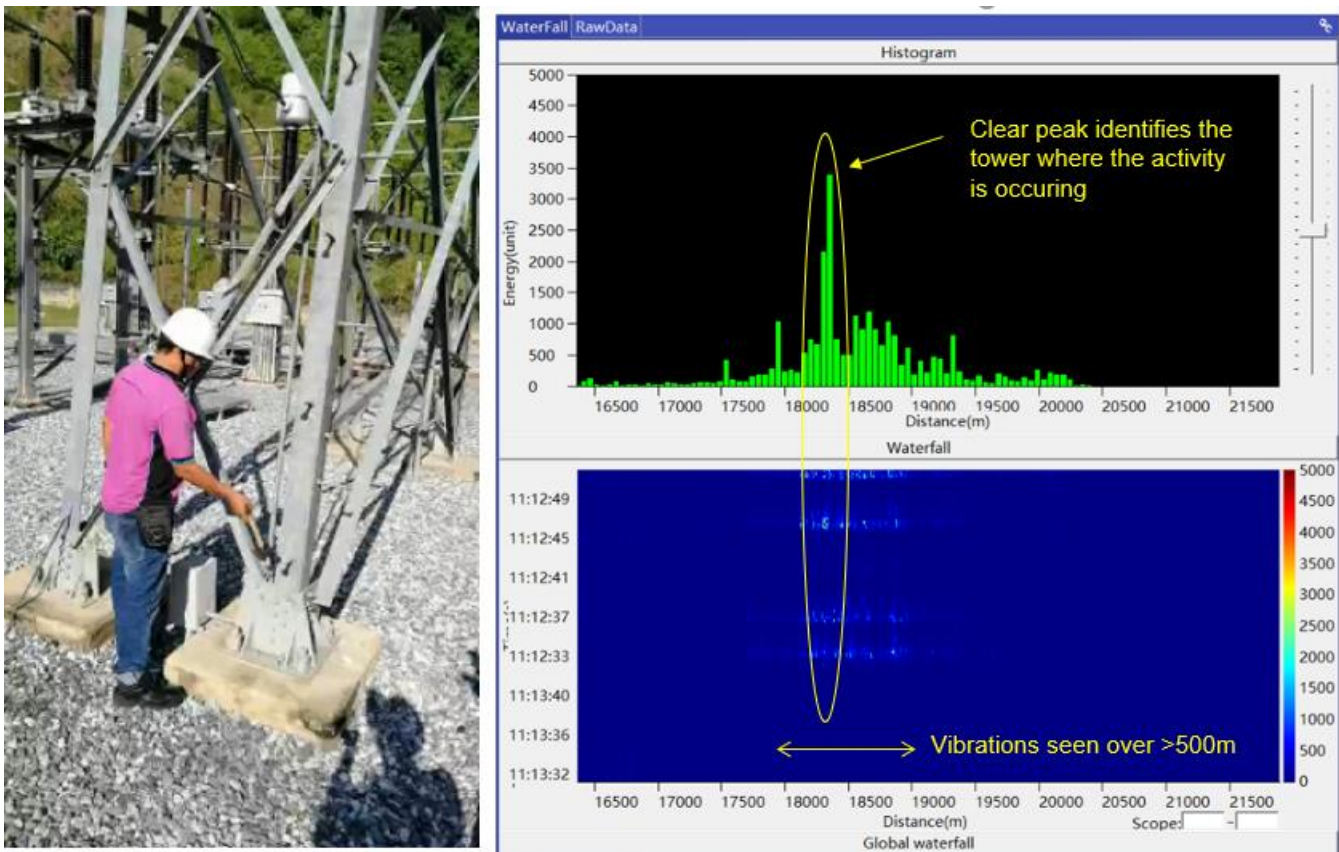


Figure 3 Horizon DAS results detecting hammering on transmission tower





For the second threat simulation, a small sawing device was deployed at the tower base. The frequency range and energy intensity of the saw was in a very different frequency band to the hammering events as can be seen from the acoustic energy histogram and waterfall displayed below. This required the Bandweaver operator to recalibrate the algorithms to take into account the different characteristics and set up the detection algorithms.

As can be seen below, the periods of activity were easily identifiable and again the peak can be clearly identified on the histogram. This allows the operator to identify the transmission tower with the issue.

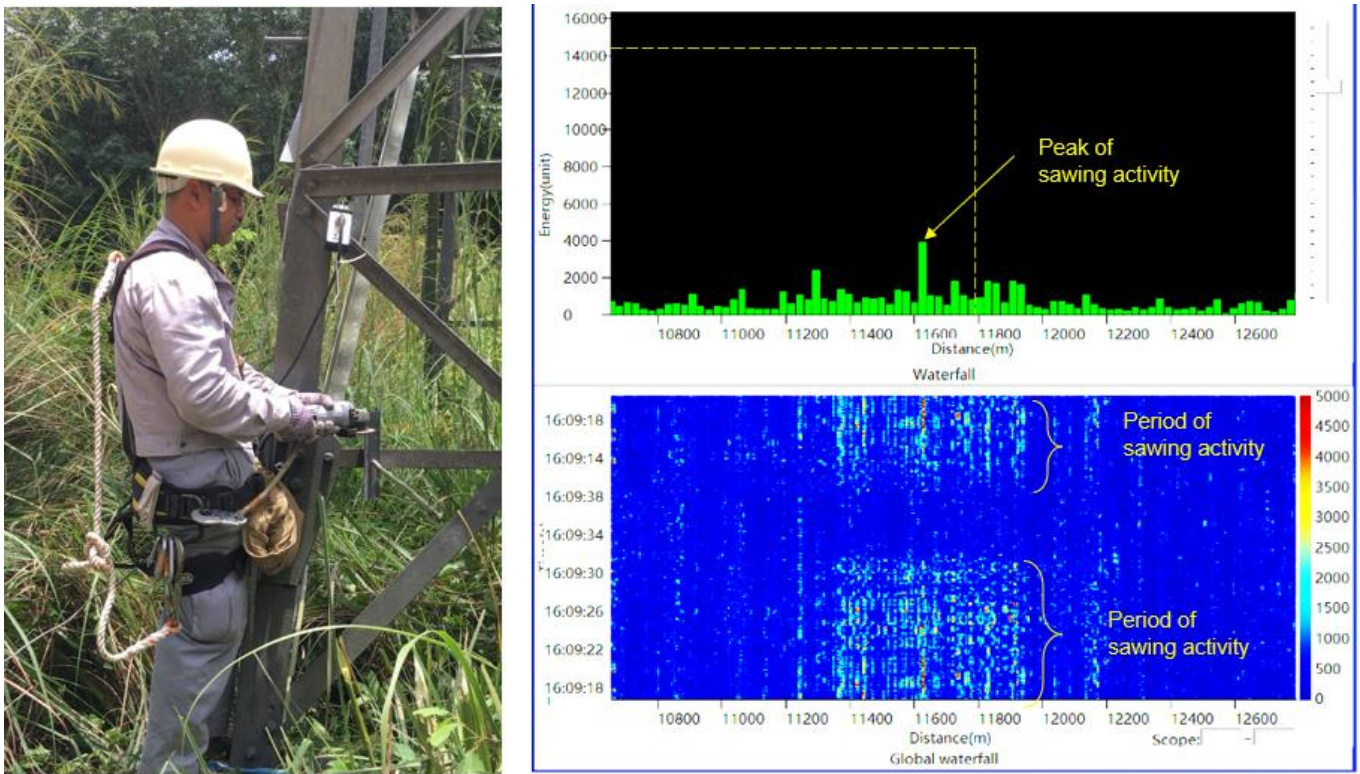
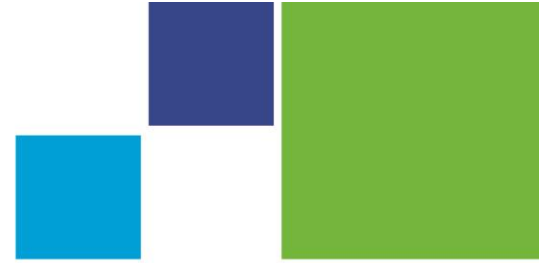


Figure 4 Horizon DAS detecting sawing activity





The third test carried out was using a grinding device. This was similar to the sawing activity in that the grinding process transmits a constant vibration during the grinding. From the histogram it can be seen that it is significantly higher energy than the sawing activity and so has a different signature which can be identified.

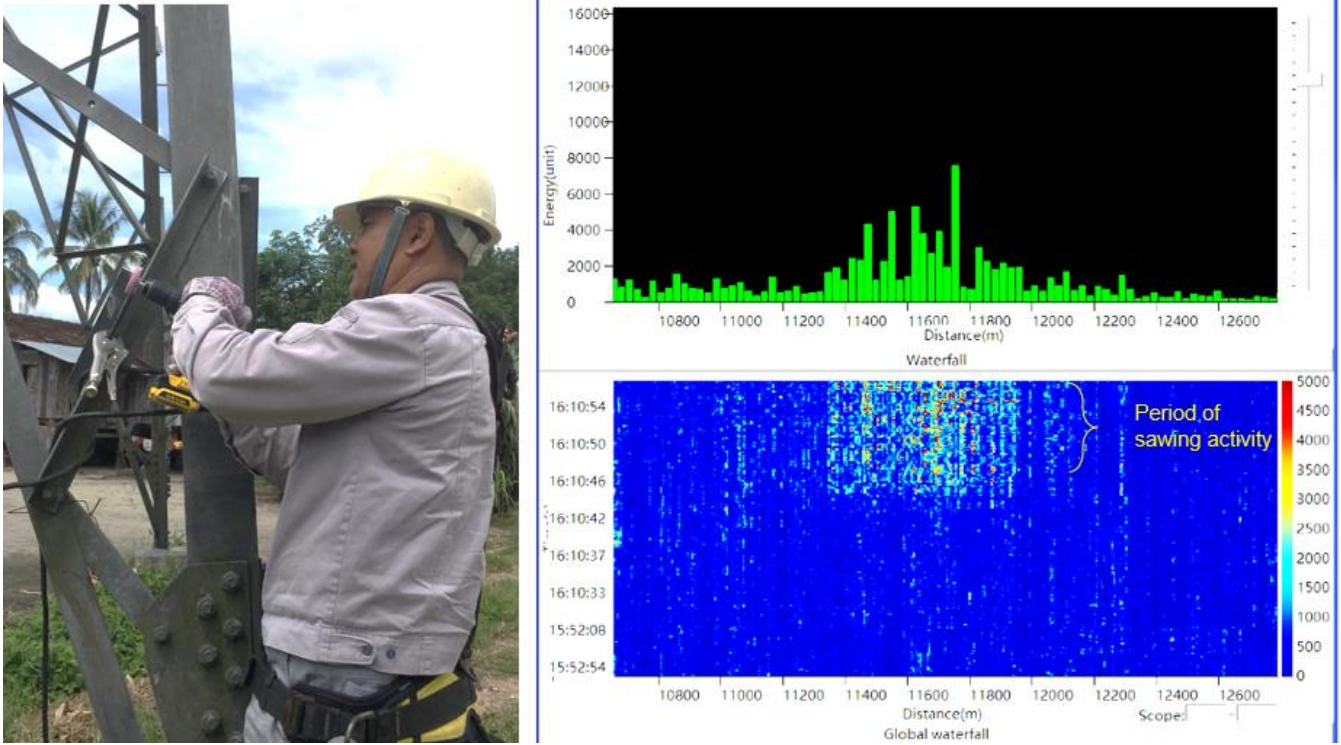


Figure 5 Horizon DAS detecting grinding activity





## BENEFITS TO THE CLIENT

The client was very satisfied with the results of the Bandweaver equipment. As part of the due diligence process the client reviewed several technologies and also other providers of DAS technology

Below are the following benefits convinced the client to proceed with procurement of this technology and specifically Bandweaver Horizon DAS

- **Low Cost of Ownership:** Fiber optic sensors are completely passive and are immune to EMC interference, not affected by dust or other environmental factors and are completely non-corrosive. Therefore, the lifetime of a fiber optic cable can be greater than 30 years, without any maintenance required.
- **High Reliability:** Another benefit of the passive, inert nature of fiber optics is that they are very reliable and so there is no downtime. In addition to the lower maintenance costs, they also provide a higher level of coverage which lowers the overall risk and improves protection levels.
- **Fully Certified to Internationally recognised standards:** The Bandweaver Horizon DAS has been designed and tested to the highest standards in the industry. This includes both safety (CE, FDA, FCC) and reliability (IEC61508, SIL 2 & 3)
- **Precise location:** Due to the distributed nature of the measurement it means that there is complete coverage of the power cable, with a measurement point every 1-5m and no gaps between points. It also can accurately locate the event typically to within 5m.
- **Machine Learning / Artificial Intelligence:** The Horizon DAS is increasingly utilising machine learning to improve the detection algorithms. This greatly improves the detection rate and constantly improves the more the system is used on the particular asset.

## ABOUT BANDWEAVER TECHNOLOGIES

Bandweaver has been providing advanced fiber optic monitoring sensors and integrated technologies since 2002. With an installed base of over 30,000km and 3,500 systems installed, our knowledge regarding the application of distributed temperature sensing technology and linear heat detection within the fire industry is second to none. We focus on the safe integration of FireLaser DTS technologies into clients' proprietary systems and Bandweaver and our partners provide exceptional systems design support, product support during installation and provide long term maintenance packages.

For further information please contact our global team at [info@bandweaver.com](mailto:info@bandweaver.com)

