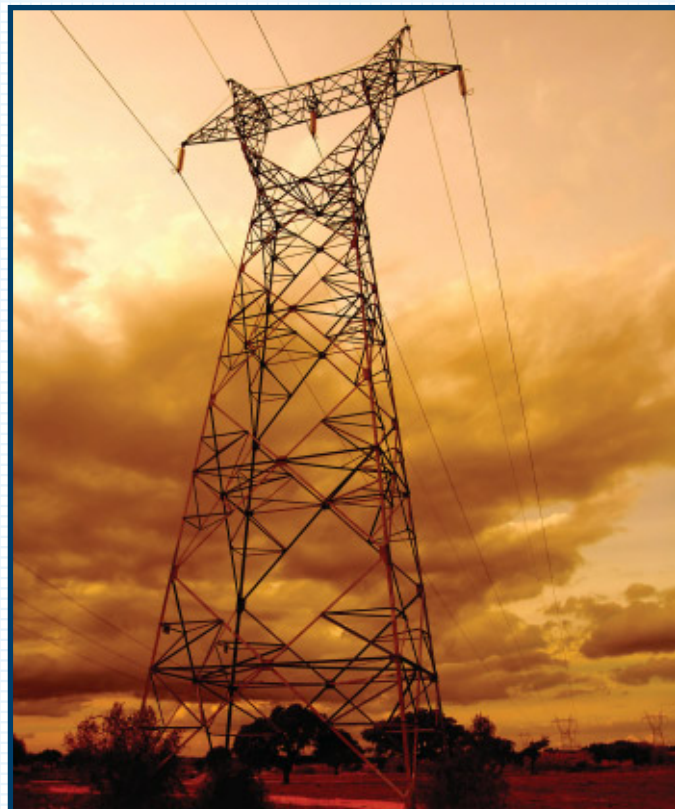
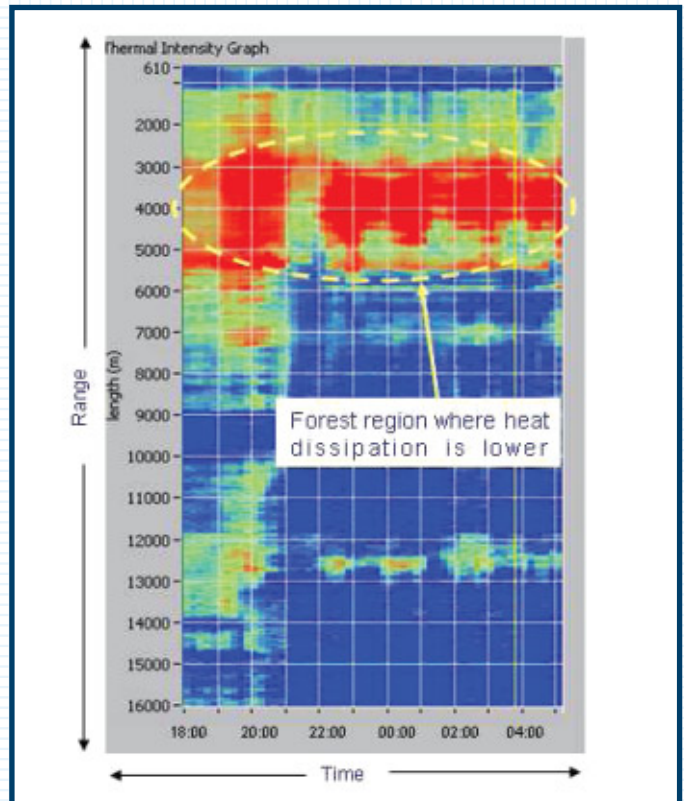


Sensornet has completed successful trials of its singlemode DTS-XR (Distributed Temperature Sensor) and DTSS (Distributed Temperature and Strain Sensing system) on behalf of a national power utility company.

Measurements were made along a 16.7km singlemode fibre contained in an overhead power line. Continuous 15-minute measurements were taken over a 10 day period during November 2005. The test was a considerable success with both instruments outperforming a competitor's DTS system. The temperature data collected allowed the utility company to identify the points along the route where there was potential for overheating, leading to potential cable sag. This information thus provided the utility with the ability to more effectively manage the cable network. Additionally, significant features were identified along the length of the cable that were not visible with competing DTS systems.



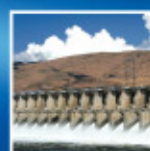
Monitoring overhead lines to optimise the network

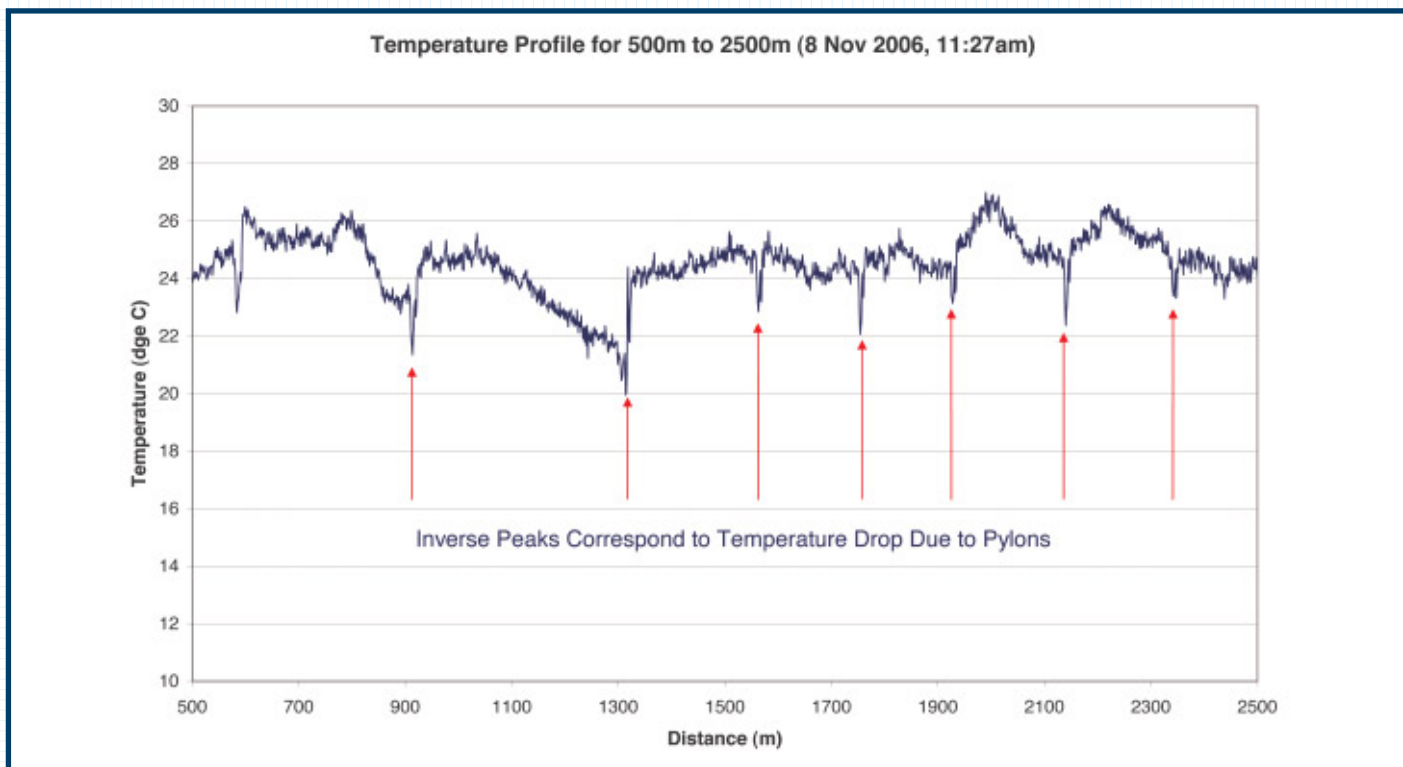


Thermal map showing forest region where heat dissipation is lower

Temperature Monitoring with the Sentinel DTS-XR

The Sentinel DTS-XR is a long range DTS capable of measuring upto 30km with temperature points every 1m along the length (e.g. for a 15km cable there are 15,000 measurement points). The Sentinel DTS-XR is available in both singlemode and multimode configurations. In this particular application, a singlemode fibre was used so the singlemode model of the Sentinel DTS-XR was used for these measurements. The SensorNet DTS-XR is the most advanced long distance DTS available and for this measurement achieved a temperature resolution of 0.7°C at 16km in just 15 minutes, improving to 0.3°C resolution after





Temperature profile of overhead power cable showing temperature drops due to pylons

a 2 hour measurement, with a 1m sampling resolution and a 2m spatial resolution. The resolution of the DTS-XR was such that features in the cable, not previously visible with other DTS systems, are easily identified. In particular, small temperature drops can be seen at the location of pylons, as could the sections of cable running through woods.

Singlemode vs. Multimode

A singlemode DTS-XR should be used, as in this case, when a singlemode fibre is installed. However, SensorNet generally recommends the use of its multimode DTS-XR, which has a far superior performance. The multimode version of the Sentinel DTS-XR has a temperature resolution a 10 times finer than that of the singlemode version, or can measure with the same resolution 100 times faster.

Hence, if the power utility were to incorporate multimode fibres into their overhead power lines then fine temperature measurements could be taken. This then makes it possible to achieve much finer resolution and gain far greater insight into the behaviour of the overhead cables.

Temperature and Strain Monitoring with the DTSS

In addition measurement were also taken using SensorNet's distributed strain sensor (DTSS). This is a very effective tool for quantifying cable sag and pinpointing to within 1m where there is excess strain in the cable. The measurements demonstrate that the SensorNet DTSS achieved a strain resolution of better than $20\mu\epsilon$ and a temperature resolution of around 0.5°C at a distance of 17km with a sampling resolution of 1m and spatial resolution of 1.5m. The measurements demonstrated that the cable installed was under little strain currently. The average strain level was measured as $-500\mu\epsilon$, well within the industry recognised safe strain limits of $2000\mu\epsilon$ or 0.2%, for a 30 year lifetime without fibre failures.

The DTSS also has the capability of measuring temperature along the length of the fibre. The DTSS temperature measurements were shown to agree well with those taken by the DTS-XR. However, SensorNet recommends the DTS-XR over the DTSS for applications where temperature only (no strain) is required as the temperature data obtained from the DTS is more accurate.

For more information on SensorNet's range of distributed sensing solutions please contact a SensorNet representative.

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THE SENSING ADVANTAGE

