

# ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

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## Applications of Meteorology within the UK Power Industry

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Dr Spillane, from the CSIRO Division of Atmospheric Physics, opened his address with a brief description of the total research activities in the UK power industry. All research and development is conducted by the Central Electricity Research Laboratories (CERL), which are based at Letterhead, just south of London. The CERL is responsible to the Central Electricity Governing Board (CEGB) and is required to justify its continued existence to the board. Professional staff are generally recruited directly from universities and consist mainly of engineers, physicists, and mathematicians.

The CERL is a large organisation maintaining an active interest in the biological, chemical, communications, electrical, engineering, materials, and physical (including atmospheric) sciences. In comparison, the atmospheric sciences group is quite small and only about 6 per cent of the published work from the CERL is related to meteorology. Meteorological priorities are decided by an oversight group, the Advisory Panel on Atmospheric Science, which has representatives from the CERL, the Meteorological Office, and the universities. This ensures close collaboration between the Meteorological Office and the CERL.

Meteorological activities within the CERL date back to the early 1960s with the development of instrumentation for studying plume rise and dispersion and have since expanded to include monitoring of regional and national dispersion of sulphur, cloud physics, dispersion of water vapour from cooling towers, long-term statistics collection, especially for the lower boundary layer, and long-term continuous recording of atmospheric sulphur. Much effort has been devoted to developing or adapting instrumentation to suit the particular requirements of the CERL. In particular, lasers have been developed and built for use in LIDAR (Light Detection And Ranging) mode to observe plumes, and work is continuing towards the development of a tuned dual laser instrument that will be used for observing dust particle size and water vapour. Sulphur dioxide samplers have been developed for installation around power stations and a great deal of time has been spent on improving a commercially available spectrometer used in detecting and tracking sulphur plumes. This has led to a trebling of the power of the spectrometer, but also a corresponding increase in errors due to random background noise.

At this stage Dr Spillane noted that sulphur constituted the major atmospheric pollutant in Britain, and that the power industry burns about 50 per cent of the total sulphur contaminated fuel used in the country with a daily emission of approximately 16 000 tonnes. To counter the local pollution problem, stacks have been steadily increasing in height (ground concentration is proportional to  $\exp(-H^2)$  where H is the height of the stack), and in the northern districts sulphur pollution from the power industry has been reduced to about 0.2 ppm compared to a background level of 3 to 5 ppm.

There have been, however, international repercussions. The Scandinavian countries, and Norway in particular, who have suffered a marked increase in sulphur pollution, are claiming that this is due to increased exports from Britain and Southern Europe and are seeking compensation from these countries. After experiments and aircraft sampling by the Meteorological Office, the British Government has admitted that 35  $\pm$  5 per cent of the sulphur in Scandinavia comes from Britain and the CEGB has now instituted observational studies to ascertain how much, if any, of this pollution is its fault.

Dr Spillane commented that 'Catch 22' seems to have been invoked here. After proving that very little of the sulphur emission from power stations remains in Britain the CEGB is now attempting to prove that there is also very little leaving the country.

Ratcliffe Power Station (see cover photograph of *Weather*, May 1976) created the first serious local environmental troubles when drizzle was recorded downstream with a pH as low as 2.4. Apart from inconvenience and corrosion problems, this resulted in a serious hazard to cyclists in the area. A further hazard has been the wetting of roads in winter, which subsequently freeze over with layers of clear ice.

Dr Spillane continued by describing the evolution of cooling towers from the old natural convection towers to towers with forced drafts and the future concept of alternate forced dry and wet drafts to control humidity. He concluded with a brief discussion of the comparisons between Australia and England, referring to the English station at Eggborough and the Victorian station at Loy Yang (Table 1). The major difference arises from the use of brown coal at Loy Yang, which has a higher water content and is burnt at twice the rate of black coal. This causes an increase in latent heat of over 400 per cent and a nearly 300 per cent increase in sensible heat emission from the chimney at Loy Yang compared to Eggborough.

In the ensuing discussion Dr Spillane agreed with a comment from Dr McEwan that some of the functions of the CERL atmospheric-environmental group are cosmetic in nature. In reply to questions by Professor Morton and Dr Smith, Dr Spillane said that aircraft observations were taken at both the English and Norwegian coasts and that the sulphur concentration was less at the latter, with the degree of reduction being dependent on the occurrence of rain over the North Sea. However, deposition rates in rain-free trajectories generally averaged 5 per cent per hour. There are also suggestions of large supplies from the northern oceans, possibly due to the Icelandic volcanoes.

Dr Zillman asked if emission rates were adjusted on the basis of weather forecasts. Dr Spillane replied that some power stations adjusted their emissions to minimise local pollution but no such attempts had yet been made on a national scale.

The last question for the evening came from Professor Morton, who enquired as to the nature of the pollution problem in Norway. Dr Spillane said that the main problem was massive fish losses in acidic rivers and, as a final comment, that there is a substantial argument that at least some of this is caused by Norwegian agricultural practices. The Norwegian soil is acid sensitive and the cutting down of large forests may be allowing an increased absorption of acid by surface water.

G.J.H.