

# thermionic power generation

An international conference on thermionic electrical power generation is being organized by the Government of the Federal Republic of Germany, in collaboration with the German Nuclear Research Centre at Jülich, to be held in June this year. The conference is being co-sponsored by the European Nuclear Energy Agency of the OECD and by the IAEA.

This will be the third major international conference of its kind, the two previous having been held in September 1965 in London and in Stresa, Italy, in May 1968. Its purpose, like that of the others, will be to examine and compare recent progress in thermionic conversion techniques, to discuss the technical problems involved and to arrive at a general assessment of the value and future possibilities of thermionic electrical power generation. Special emphasis will be given to applications, hardware developments and testing.

The main topics to be considered at the conference will be: thermionic systems (design and performance, applications and economics); thermionic reactors (the design and fabrication of thermionic fuel elements); in-pile testing; materials and components; nuclear fuels; converter performance and analysis; and surface and plasma phenomena. In addition to original papers there will be a number of review papers on topics of particular interest. Further details of the conference may be obtained from Dr. P. von Handel, Kernforschungsanlage Jülich GmbH, D-5170 Jülich, Postfach 365, Federal Republic of Germany.

## Principles and practice

The basic principle of thermionic power generation is the same as that of the thermionic valve — once (before the advent of transistors) at the heart of all electronic equipment. In such a system electrons are 'boiled off' an emitting electrode, the cathode, by heating it, and collected by a second electrode, the anode, placed nearby. The electrons return to the cathode via an external electrical circuit. Power densities of up to several tens of watts per square centimetre of electrode area are theoretically attainable in such thermionic diodes.

Considerable progress has been made in the field since the last international conference at Stresa in 1968. In particular, the concept of a thermionic reactor — a nuclear reactor using thermionic diodes for the direct conversion of heat into electrical energy — has emerged

from an "advanced system" stage to a "near term" stage. Proofs of this development are the existing thermionic reactor projects in several countries, notably the critical experiments at Cadarache, France, and at Jülich, and the power reactor Topaz 2 at Obninsk, in the USSR, which is capable of producing 10 kW by means of thermionic fuel elements and has operated for many thousands of hours. Plans for building similar reactors in other countries are being developed, and in France, Germany and the United States work on special nuclear fuels for this application is increasing.

This note is based on a press release issued jointly by ENEA and the IAEA.

