

awaited and upon their completion it could be developed further. Of the remaining compounds, JM82 and TNO-6 would appear not to merit further study, while JM40 is still at an early stage of its phase I evaluation. Interest-

ingly, although JM82 and TNO-6 exhibit activity against experimental cisplatin-resistant tumours, no evidence has accrued to suggest that these compounds would possess comparable activity in the clinic.

Background References

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The United States National Fuel Cell Seminar

Progress on fuel cells was discussed at the meeting held at Orlando, Florida during November 1983. The most notable developments were the test programmes organised by gas and electricity supply utilities, and also the intense efforts by Japanese industry.

Overall, the conference presented an impressive picture of fuel cell commitment. In the United States alone, expenditure on research and development, and demonstration programmes amount to \$78 million, of which \$55 million is devoted to phosphoric acid cells using platinum catalysts. Japanese competition is likely to lend added impetus to rapidly commercialise these new energy generators.

The on-site/integrated energy system programme is proceeding well, with 45 fuel cells being installed by 30 gas utilities in the U.S.A. and Japan. Surveys carried out by gas companies indicate a substantial market for combined heat and power devices in a variety of applications including nursing homes and hotels. The present manufacturers (United Technologies Corporation) were said to be increasing module size from 40kW to between 200kW and 400kW, while Engelhard Corporation are constructing 100kW generators.

Two 4.5MW power stations have been built by United Technologies Corporation and installed in New York and Tokyo for operation by Consolidated Edison and Tokyo Electric Power, respectively. The New York unit has

been plagued by legislative and technical problems and it is now hoped to start operation early in 1984. The Tokyo plant was started up in April 1983, site preparation, installation and commissioning having taken less than 3 years. To date, the plant has produced 177,000kWh of power at an overall efficiency of 38.6 per cent.

The efforts of Japanese industry were reflected in the number of delegates attending, 55 out of 315, and in the numerous papers presented. The Ministry of International Trade and Industry are funding two major groups to develop 1MW phosphoric acid fuel cells by 1986. Mitsubishi and Fuji Electric Company are studying atmospheric pressure technology, operating at 190°C, with a current density of 200mA/cm² at 0.7 volt per cell and a platinum loading of 0.9mg/cm². They have made a 50kW unit and are designing a 200 to 300kW module.

In addition, Hitachi and Toshiba are collaborating to develop high pressure technology, operating at 7 atmospheres and 205°C, the cells giving 220mA/cm² at 0.72 volts, with a platinum utilisation of 6.5g/kW.

Each of the Japanese companies are developing systems independently, Toshiba having built a 50kW unit and Fuji having had a 30kW generator on trial at a power station in Kansai province. Sanyo reported progress on their 50kW combined heat and power unit, developed using technology licensed from Energy Research Corporation. D.S.C.