

## XIV. ENERGY CONVERSION RESEARCH\*

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## A. STATUS OF RESEARCH

### 1. ALKALI-METAL VAPOR STUDIES

Our studies of the condensing plasma, both theoretical and experimental, indicate that probably it will not be feasible to maintain a state of nonequilibrium ionization in a wet vapor. This conclusion follows from two facts.

a. At moderate current densities, the moisture increases the slope of the curve of  $\log \sigma$  versus  $\log j$  to greater than unity. With this characteristic, the plasma is unstable to current concentration.

b. At higher current densities, the flux of energy to the liquid droplets is such as to evaporate them quite rapidly.

Thus we are forced to the conclusion that an alkali-vapor MHD generator should operate with dry vapor. Our evaluation of the system potential will proceed on this basis.

### 2. LARGE NONEQUILIBRIUM GENERATOR

During this quarter, the large generator was operated twice with a pre-ionizer. In the first run, load resistances from 100 to 3 ohms per electrode pair were used. Pressure distributions along and across the channel were taken. Although the data are still being analyzed two points can be made.

a. When the pre-ionizer was operating, the pressure distribution in the channel was nearly independent of load resistance. When the pre-ionizer was turned off, the pressure rose throughout the channel, the increase being approximately 30% at the entrance and a factor of two at the exit. This may indicate a large increase in dissipation when the pre-ionizer is off.

b. The performance of the channel appeared to improve slightly with time during

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the run. Because of this, the second run was made with a fixed-load resistance of 3 ohms, in an attempt to define the time dependence of the performance. The data from this run have not yet been analyzed.

#### 3. INSTABILITIES

A general theoretical study of MHD instabilities is being made, which encompasses both magnetoacoustic and electrothermal waves, and accounts for interaction between the two. It also includes the effects of radiative heat loss.

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