

Solar Thermionic Energy Convertors

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With thermionic convertors efficiencies of 10% have been obtained today and it is expected that an efficiency of at least 20% can be reached. The main problems with this convertor are connected to the stability of high-temperature materials.

A thermionic convertor will operate between for instance 1700 K and 1000 K. The high temperature is obtained by concentrating sunlight. The convertor generates a DC voltage. The «low» temperature (1000 K) heat can be partly used as process heat for electrolysis. In combination with the electricity generated, hydrogen can be produced in a high-temperature electrolyzer (Hot Elly). The rest of the low temperature heat can be used in a steam cycle; this way the overall efficiency can be increased to about 40 or 50%. The hydrogen can be used to produce the heat needed for the steam cycle during periods that there is no sun.

So an important advantage of this system is that it can be self-supporting, without the use of external electrical or gas supplies. Such systems are especially suited for areas with a high percentage of direct solar radiation. Research has to be done mainly in the field of high-temperature materials and high-temperature electrolyzers.

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