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Energy Conversion*

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DIRECT ENERGY CONVERSION DEVICES AND
SYSTEMS FOR NUCLEAR AUXILIARY
POWER (SNAP)

A Literature Search

Compiled by

Henry D. Raleigh

Sidney F. Lanier

~~December 1961~~

January 1963

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DIRECT ENERGY CONVERSION AND SYSTEMS FOR
NUCLEAR AUXILIARY POWER (SNAP)

Introduction

The development of nuclear auxiliary power units for use in space vehicles and other specialized purposes is being carried out under the Commission's SNAP program. Two approaches are currently being followed: (1) radio-isotope-powered units, and (2) reactor-powered units.*

The radioisotope SNAP program was initiated in March 1956 at the Nuclear Division, Martin Company, Baltimore. The first complete unit, SNAP-3, was delivered to the AEC in January, 1959, and was publicly demonstrated at the White House on January 16, 1959. This proof-of-principle device was fueled with polonium-210 and generated 2.5 watts of electricity.

Two similar devices were successfully placed into orbit as power sources in the TRANSIT-4A and TRANSIT-4B satellites on June 29 and November 15, 1961. These generators were initial steps in the development of SNAP-9A units which are scheduled to be employed in the Navy's full-scale operational TRANSIT navigational system.

Other radioisotope-powered generators under development and in operation are: the SNAP-7 series for use in coastal navigation systems and automatic remote weather stations; SNAP-11 for use in NASA's SURVEYOR "soft" lunar landing missions; and SNAP-13 for application to advanced space vehicles.

Development work on reactor SNAP devices was initiated at Atomics International, Canoga Park, California in 1956. A prototype SNAP-2 reactor, designated the SNAP Experimental Reactor (SER), achieved full power (50 kw, 1200F) in November 1959, and successfully completed initial testing on November 18, 1960, accumulating a total of 224,000 kilowatt-hours during this time. A second developmental reactor is being combined with a turboelectric power conversion system and is designated the SNAP-2 Development System (S2DS). The reactor for the S2DS system achieved power operation in August 1961. The objective of the SNAP-2 program is the development of a flight-test system for delivery in the 1963-1965 period.

Other reactor SNAP systems under development are: SNAP-4, a very compact reactor-turboelectric unit for long unattended life in an underwater or remote terrestrial environment; SNAP-8, a nuclear electric generating system for the NASA space program to be used for power in orbital test of electric

* It is helpful to remember that the SNAP numbering system uses even numbers for reactor-powered devices (SNAP-2, etc.) and odd numbers for radioisotope-powered devices (SNAP-1, etc.).

propulsion devices and high-power communications satellites; SNAP-10-A, a low-power, light-weight, electric power source for space and military applications; and SNAP-50, an advanced high power reactor unit being developed for future space requirements.

SNAP devices generate electricity by the direct conversion of nuclear heat, and by advanced turbogenerator components. Direct conversion is achieved primarily by the use of thermoelectric and thermionic techniques and, as a result, has led to the recent volume of research and development publications in these areas.

This search contains 552 references to publications on the SNAP program and related topics. The references were taken from Nuclear Science Abstracts (NSA) and cover the issues through December 31, 1962. NSA abstract numbers are given in each case to enable easy access to the abstracts.*

The references are grouped into broad subject categories as indicated in the table of contents. Within each subject category they are arranged by issuing agencies which are in alphabetical order.

The AEC-sponsored reports may be examined at the depository libraries listed in each issue of NSA. They may also be purchased from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., in full-size printed copy, photostat, facsimile, or microfilm form as indicated.

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* This revision contains several references to recent reports that have not yet appeared in NSA. These references will not contain NSA abstract numbers.

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**Tracerlab, Incorporated,
Boston, Massachusetts**

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**United Kingdom Atomic Energy Authority,
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