OAK RIDGE ISOTOPE PRODUCTS AND SERVICES – CURRENT AND EXPECTED SUPPLY AND DEMAND

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I. INTRODUCTION

Oak Ridge National Laboratory (ORNL) has been a major center of isotope production research, development, and distribution for over 50 years. Currently, the major isotope production activities include (1) the production of transuranium element radioisotopes, including ^{252}Cf; (2) the production of medical and industrial radioisotopes; (3) maintenance and expansion of the capabilities for production of enriched stable isotopes; and, (4) preparation of a wide range of custom-order chemical and physical forms of isotope products, particularly in accelerator physics research. The recent supply of and demand for isotope products and services in these areas, research and development (R&D), and the capabilities for future supply are described in more detail below. The keys to continuing the supply of these important products and services are the maintenance, improvement, and potential expansion of specialized facilities, including (1) the High Flux Isotope Reactor (HFIR), (2) the Radiochemical Engineering Development Center (REDC) and Radiochemical Development Laboratory (RDL) hot cell facilities, (3) the electromagnetic calutron mass separators and the plasma separation process equipment for isotope enrichment, and (4) the Isotope Research Materials Laboratory (IRML) equipment for preparation of specialized chemical and physical forms of isotope products. The status and plans for these ORNL isotope production facilities are also described below.

II. TRANSURANIUM ELEMENT RADIOISOTOPES

Under the provisions of the National Transplutonium Element Production Program, the Transuranium Processing Plant (TRU), now known as the REDC, and the neighboring HFIR were built at ORNL in the mid-1960s for the "large-scale" production of the transuranium elements for research in nuclear chemistry and physics. Since then, the facilities at REDC and HFIR have become the center for production, storage, and distribution for the transuranium isotopes, including ^{248}Cm, ^{249}Bk, ^{249}Cf, ^{252}Cf, ^{253}Es, ^{254}Es, ^{255}Fm, and ^{257}Fm. In addition to these "mainline" products, some 30 other rare research isotopes, such as ^{242}Cm, ^{245}Cm, and ^{250}Cf, have been produced in small quantities to satisfy the specific experimental requirements of various researchers. To date, nearly 2000 shipments of these transuranium element products have been made to more than 30 different laboratories both domestically and internationally.

The main objectives of the program, from its inception to the present, have been to produce as many of the transplutonium nuclides as possible and to provide them in the highest possible isotopic composition and chemical purity and in the physical forms specified to meet the requirements of individual researchers. The production and distribution of these isotopes are carefully planned and carried out to meet the recommendations of the Transuranium Isotopes Users' Committee, which is composed of representatives from the major U.S. Department of Energy (DOE) laboratories having an interest in transuranium element research. Committee recommendations are based on the most-effective use of these materials to meet the needs of DOE's important research and development programs.

A. Production Facilities

Specialized facilities with diversified processing and fabrication capabilities are required for the production of the transuranium element products. First, a high-flux reactor is required with sufficient neutron fluxes to transmute the target materials to the desired transplutonium isotopes. The HFIR was designed with such neutron fluxes ($>10^{15}$ neutrons/cm^2-s) expressly for the production of the transplutonium element products. Secondly, the reactor production must be coupled with hot cell