FINDING OF NO SIGNIFICANT IMPACT FOR THE ENVIRONMENTAL ASSESSMENT FOR THE NORTHSTAR MEDICAL TECHNOLOGIES LLC COMMERCIAL PRODUCTION OF THE MEDICAL ISOTOPE MOLYBDENUM-99, BELOIT, WISCONSIN

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE),
National Nuclear Security Administration (NNSA)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: NNSA has completed the *Final Environmental Assessment for NorthStar Medical Technologies LLC Commercial Domestic Production of the Medical Isotope Molybdenum-99 (Mo-99 EA)* (DOE/EA-1929). Based upon the analysis in the environmental assessment (EA), NNSA has determined that its proposed action—to provide financial assistance to NorthStar Medical Technologies LLC (NorthStar) in a cost-sharing arrangement under a cooperative agreement to accelerate the establishment of commercial production of molybdenum-99 (Mo-99) using accelerator technology and without the use of highly enriched uranium (HEU)—would result in no significant impacts.

BACKGROUND: The majority of the world's Mo-99 is currently produced at aging facilities in Europe, Canada, and South Africa, using primarily HEU, a nuclear weapon material. Through the process of radioactive decay, Mo-99 produces the metastable isotope technetium-99m (Tc-99m), which is used for medical diagnostic procedures. The uncertain reliability of the aging reactors currently used to produce Mo-99 and numerous statements that the Canadian National Research Universal reactor (a Mo-99-producing reactor) will cease medical isotope production in 2016 demonstrate the necessity to support the establishment of a reliable supply in an accelerated timeframe. As part of its nuclear nonproliferation mission, NNSA is working through its Global Threat Reduction Initiative to (1) accelerate establishment of commercial Mo-99 production in the United States without the use of HEU; (2) support existing international producers in converting Mo-99 production from HEU targets to low enriched uranium targets; and (3) facilitate transition of this industry to an economically sustainable model that does not rely on government subsidies to produce Mo-99.

In March 2010, NNSA issued a funding opportunity announcement to establish cooperative agreements with commercial entities for the purpose of accelerating the establishment of non-HEU-based technologies for production of the medical radioactive isotope (radioisotope) Mo-99. Based on one of these selections, NNSA proposes to provide funding to NorthStar for accelerator-based production of Mo-99 without the use of uranium in the town of Beloit, Wisconsin. In accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and DOE implementing procedures, NNSA is required to evaluate the impacts of any major proposed actions that have the potential to significantly affect the quality of the environment. In compliance with CEQ regulations (40 CFR Part 1500) and DOE's NEPA implementing procedures (10 CFR Part 1021), NNSA has prepared the *Mo-99 EA* to meet its NEPA responsibilities related to the proposal to provide Federal funding to accelerate establishment of the commercial production of Mo-99 using accelerator-based technology without the use of HEU.

PURPOSE AND NEED: The overall purpose and need for NNSA action pursuant to the funding opportunity is to accelerate domestic endeavors to demonstrate and produce a reliable supply of the Mo-99 isotope using non-HEU technologies. NorthStar is one of the competitively selected companies chosen to demonstrate its technical proposal for the production of Mo-99. Following this selection and because of an existing Phase I cooperative agreement with NorthStar, NNSA has the opportunity to continue to support an accelerator-based technology to produce 3,000 6-day curies[1] per week of non-HEU-based Mo-99 in the United States by the end of 2014. This and other selected technologies are needed to reduce the potential for HEU proliferation and to produce a reliable domestic supply of Mo-99.

DESCRIPTION OF THE PROPOSED PROJECT: Using the funding provided by NNSA, NorthStar proposes to construct a linear accelerator (linac) and chemical processing facility (the NorthStar facility) in Beloit to produce Mo-99. The proposed project would provide commercial-scale production of the radioisotope Mo-99 using electron linac technology. Through the process of radioactive decay, Mo-99 produces Tc-99m, which is used for medical diagnostic procedures.

Six steps are included in the production of Mo-99 using the technology proposed by NorthStar. These steps are (1) manufacture and shipment of the target material made of natural molybdenum or molybdenum enriched in the isotope Mo-100, (2) irradiation (also called bombardment) of the targets using linacs at the NorthStar facility, (3) processing of the targets at the NorthStar facility to produce the Mo-99 radiochemical, (4) shipment of the Mo-99 radiochemical from the NorthStar facility to the end-user medical facility, (5) return shipment of the spent/unusable portion of the radiochemical from the end-user facility, and (6) management of the spent or unusable portion of the Mo-99 radiochemical at the NorthStar facility.

The *Mo-99 EA* evaluates the NNSA-supported steps of the construction and operation of the proposed NorthStar facility for Mo-99 production. Analyses in this *Mo-99 EA* evaluate the following activities:

- Construction of a linac and chemical processing facility at Beloit for the production of the Mo-99 radiochemical
- Operation of the linac and chemical processing facility for irradiation of molybdenum targets by the NorthStar linacs and chemical dissolution of the targets
- Preparation of the Mo-99 radiochemical and packaging for shipment in the NorthStar processing facility (not including transport of the radiochemical to the end-user and not including the end-user's use of the Mo-99)
- Management of waste (radioactive, hazardous, and nonhazardous) generated by the facility construction and operations, including chemical processing of targets

NorthStar expects that its capacity to produce 3,000 6-day curies of Mo-99 per week would be achieved in much less than 1 year following initiation of accelerator operations. However, for purposes of evaluating potential environmental impacts, this *Mo-99 EA* considers the requirements associated with a full year of operation. Operations beyond meeting the production capacity of 3,000 6-day curies per week and those not funded by NNSA are not included in the *Mo-99 EA* analyses.

[1] The term "6-day curie" comes from producers that calibrate the sales price to the number of curies present in a shipment 6 days after it leaves the production facility.

ALTERNATIVES CONSIDERED: In addition to the proposed action, NNSA considered the No Action Alternative, as required under NEPA. The No Action Alternative provides an environmental baseline with which impacts of the proposed project can be compared. Under the No Action Alternative, NNSA would not provide funding for the proposed project. It is likely that, in the absence of NNSA funding, NorthStar would proceed with the project, but at a slower pace, which would delay construction of the proposed facility and establishment of the capacity to produce 3,000 6-day curies of Mo-99 per week. It is also possible that the proposed project could be canceled. Therefore, the NNSA No Action Alternative could result in one of two scenarios: (1) the proposed project would be pursued by NorthStar without the benefit of NNSA financing or (2) the proposed project would not be pursued. Under either scenario, if NNSA decided not to fund the project, there would be no continuing NNSA involvement and thus no Federal action.

For purposes of analysis and establishment of a meaningful environmental baseline in this EA, NNSA assumed that, under the No Action Alternative, NorthStar would not proceed, meaning that current environmental conditions and land uses would continue. This scenario would not contribute to NNSA's objective to accelerate establishment of a reliable U.S. supply of Mo-99 produced without the use of HEU.

ENVIRONMENTAL CONSEQUENCES: NNSA evaluated the potential environmental consequences of the proposed project and the No Action Alternative. NNSA considered all environmental resource areas in the preparation of the EA. However, not all areas were evaluated at the same level of detail. NNSA focused more-detailed analysis on areas that would require new or revised permits, have the potential for significant adverse environmental impacts, or have the potential for controversy. Potential impacts of the proposed action for the resources evaluated in the *Mo-99 EA* include the following:

> **Geology and Soils**—Construction activities would include excavation and grading to prepare for building footings and foundations, construction material staging, and parking areas. Grading activities would likely affect only the upper 1.5 meters (5 feet) of surface soil and would not result in net removal of soil or additions of fill material. Excavation of the subgrade basement would result in removal of up to approximately 21,000 cubic meters (28,000 cubic yards) of soil and rock material. The excavated material would be either used on site for grading purposes (if of suitable properties) or transported off site for disposal or for use as construction fill material. The infrequent occurrence and low magnitude of previous earthquakes in the region indicate that impacts from earthquakes on the facility during operations are unlikely and are expected to be minimal.
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> **Water Resources**—Construction of the proposed facility and associated parking areas and roadways would likely involve conversion of less than 2 hectares (5 acres) of the property to impervious surface. This would result in a slight increase in potential runoff from the project site compared with the site's undeveloped state. Facility operations are not expected to require direct withdrawals of groundwater, as all required water would be obtained from municipal supplies. No impacts on wetlands or floodplains are expected.
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> **Air Quality**—Construction activities associated with the proposed facility would generate air pollutant emissions from site-disturbing activities, such as grading, filling, compacting, trenching, and operation of construction equipment. Emissions from construction activities would not affect local or regional National Ambient Air Quality Standards attainment status. Construction and operation activities would contribute directly to emissions of greenhouse gases. The maximum annual greenhouse gas emissions would be about 0.037 percent of Wisconsin's 2009 carbon dioxide emissions.

The proposed facility would produce air emissions from operation of the building's heating system. Process emissions are not expected, but the use of chemicals used to dissolve Mo-99 targets and the resulting evaporation could result in small emissions. Operations emissions under the proposed project are not expected to (1) cause or contribute to a violation of any Federal or State ambient air quality standard; (2) expose sensitive receptors to substantially increased pollutant concentrations; or (3) exceed any evaluation criteria established by a State implementation plan. In addition, operations emissions are not expected to trigger the need for a Prevention of Significant Deterioration or Title V operating permit.

Ecological Resources—Impacts on vegetation from construction of the proposed NorthStar facility would be negligible, as most of the vegetation at the project site is removed annually to allow for the growth of row crops. No impacts on federally or Wisconsin-listed species are expected from construction or operation of the proposed NorthStar facility, as these activities would occur on land that lacks suitable habitat.

Land Use—Agricultural use of the project site would cease with construction of the proposed NorthStar facility. The construction and operation of the proposed facility would be consistent with the City of Beloit's zoning for this site as limited manufacturing and with its future land use designation as Business Park.

Visual Resources—Exposed soils from construction would have a minor visual impact that would last for more than a year until the facility construction is complete and landscaping is installed. Heavy equipment at the project site would be consistent in appearance with other recent construction projects in the area, including Gateway Boulevard, the Alliant Energy substation, and housing units. The visual intrusion on the landscape would be similar to that of the electrical substation under construction to support the Gateway Business Park. The emissions stack for the chemical processing area would be approximately 18 meters (60 feet) tall and 0.6 meters (2 feet) in diameter. The height of this stack would be comparable to the overhead transmission power lines installed at the substation under construction north of the project site.

Noise—The closest residential area is approximately 210 meters (700 feet) to the south of the project site; populations would likely be exposed to noise levels of less than 65 decibels A-weighted from construction activities. Noise generation would last only for the duration of construction activities and would be limited to normal working hours. Noise would stem from the operation of linac and chemical processing equipment. While operations are likely to produce considerable noise, the noise would be contained within the production facility and would have no impact on the surrounding ambient noise levels. Employees working in this environment would follow best management practices, such as the use of hearing protection equipment, as necessary to limit exposure above the permissible levels defined by the Occupational Safety and Health Administration.

Infrastructure—Up to 1,000 megawatt-hours of electricity for construction would be required and supplied by Alliant Energy, the local utility; additional power for construction activities would be supplied by onsite generators, as needed. Operational power needs would be up to 144,000 megawatt-hours per year. Although demand on the existing electrical system would increase, it is not expected to exceed the existing supply or the ability to deliver it.

The proposed facility would use natural gas for heating and other building functions; however, the demand for natural gas from operation of the proposed facility is expected to be minimal and would not exceed the available supply.

Water demand would increase slightly during construction and operations; however, potential increases in water demand associated with construction and operations would be temporary and are not expected to exceed existing capacity.

Ground disturbance during construction would temporarily increase the potential for soil erosion and sediment transport during sheet-flow runoff. To minimize these impacts, an erosion control and stormwater management plan would be developed in accordance with Wisconsin Department of Natural Resources regulations. Soil compaction and increased impermeable surfaces (e.g., new structures, pavements, sidewalks) would decrease stormwater permeation into the ground and thereby permanently increase sheet-flow runoff into the stormwater drainage system.

The wastewater discharge needs of the proposed NorthStar facility would be met by connecting to the City of Beloit wastewater system. This would slightly increase the load on the system, but would be a small increment of the total system capacity.

No impacts on communications systems are expected during construction or operations of the NorthStar facility.

The level of vehicle and truck traffic on local roadways as a result of construction and operation activities is expected to be minimal and to not exceed existing design capacity. No additional transportation infrastructure or alterations to existing infrastructure would be required under the proposed project.

Human Health and Safety – Normal Operations—Construction would entail potential hazards to workers typical of any construction site. Normal construction safety practices would be employed to promote worker safety and reduce the likelihood of worker injury during construction. Nonetheless, construction accidents could occur.

Air emissions from the facility have the potential to contain radioactive material as a result of the accelerator operations and the dissolution and packaging of radioactive materials in the hot cells. However, the facility design and operation are intended to control the amount of radioactive material released to a negligible amount. Liquid waste generated during operations would be collected, temporarily stored on site, and sent off site for treatment and disposal. The proposed facility would not release any radioactive material through wastewater. No public dose from air emissions or wastewater is expected. Although radiological emissions are not expected, if any emissions were to occur, impacts on the public would be negligible.

The potential sources of exposure for the workers include the activities associated with the linac irradiation of the Mo-100 targets, transfer of irradiated material into the hot cells, packaging and shipment of the Mo-99 product, and preparation of any radioactive waste for disposal. The Mo-99 production facility design and operation would include several features to limit worker dose. Only a fraction of the workers at the Mo-99 production facility are expected to receive any radiation dose; individual worker doses would not exceed the 5-rem-per-year regulatory limit.

Human Health and Safety – Accidents and Intentional Destructive Acts—A range of accidents involving radioactive Mo-99 or chemicals to be used in the process was evaluated. Risks to the public from most postulated accidents would be small. Impacts of extremely unlikely severe accidents, such as building collapse from an earthquake or explosion, could extend to members of the public. A severe accident causing release of the entire helium inventory (from the linac target-cooling system) could result in dispersion of hazardous concentrations to a distance of about 85 meters (280 feet) from the building; the distance from the building to the site boundary is about 20 meters (66 feet). A severe accident involving direct exposure to a freshly irradiated molybdenum target would result in a risk of a latent cancer fatality of 7×10^{-4} (1 chance in 1,400) to someone exposed at the site boundary for an hour. Although considered extremely unlikely, an intentional destructive act involving release of a significant portion of a freshly irradiated target would result in a risk of a latent cancer fatality of 8×10^{-5} to 3×10^{-4} (1 chance in 3,000 to 13,000) to a person at the site boundary.

Socioeconomics—Neither construction nor operations would involve any change in the number of personnel in the region of influence (ROI). The existing construction industry within the ROI is expected to adequately meet demands for the number of workers that would be required to complete construction activities. While workers in some specialized scientific disciplines may be needed from outside the ROI for facility operations, most of the operational labor force of 150 is expected to be supplied locally.

Cultural Resources—No historic properties are located within the area of potential effect for the proposed NorthStar facility. Construction impacts would be limited to the project site and are not expected to alter the current visible or audible characteristics of historic properties located in Rock County, Wisconsin. Because no historic properties are located near the project site, operation of the proposed NorthStar facility would have no impact on cultural resources.

Waste Management—Excavation of the subgrade portion of the facility would generate up to 23,000 cubic meters (30,000 cubic yards) of soil/rock that would be disposed of off site if not used for onsite grading. The soil/rock material would be recycled/reused as construction fill for other construction or grading purposes, if the material properties are acceptable. Construction activities would generate about 160 metric tons (175 tons) of solid waste in the form of wood, metal, concrete, or other miscellaneous construction debris. Construction waste would be recycled to the extent practicable or disposed of at an appropriate licensed landfill or waste management facility.

Operation of the proposed NorthStar facility is expected to result in waste generation during the process of bombarding targets and preparing the Mo-99 product for shipment. About 10.4 cubic meters (14 cubic yards) of low-level radioactive waste, 2.4 cubic meters (3.1 cubic yards) of hazardous waste, and 45 cubic meters (59 cubic yards) of solid waste would be generated annually. No mixed low-level radioactive waste generation is expected. Existing commercial or municipal treatment and disposal facilities would be able to accommodate all projected quantities of waste generated by the proposed facility.

No process-water discharges are expected. Sanitary waste from the facility would be discharged to the sanitary sewer system; the quantity of waste, primarily from personnel water use, would be a small addition to the load on the local sewer system.

Environmental Justice—Construction and operational activities are not expected to have adverse impacts on any of the local populations. Consequently, there would be no disproportionately high and adverse impacts on low-income or minority populations.

Energy Conservation, Renewable Energy, and Sustainable Design—Energy consumption would increase due to the construction and operation of the proposed NorthStar facility.

NNSA conducted consultations with Wisconsin State Historic Preservation Office (SHPO) and the U.S. Fish and Wildlife Service (USFWS) Wisconsin Ecological Services Field Office. NNSA received correspondence from both the SHPO and USFWS supporting determinations of no impacts as a result of the proposed project, subject to recommendations in their letters (included in an appendix in the final EA).

Under the No Action Alternative, NNSA would not provide funding through the Global Threat Reduction Initiative to NorthStar for the construction of a linac and chemical processing facility in Beloit, Wisconsin, to produce Mo-99. In the event the NorthStar facility is not built, as was assumed for the No Action Alternative, current environmental conditions and land uses would continue.

PUBLIC PARTICIPATION: NNSA issued the draft EA for public comment on July 24, 2012. The draft EA was distributed to the Governor of Wisconsin, Wisconsin SHPO, Wisconsin Office of Energy Independence, Wisconsin Department of Natural Resources, USFWS Wisconsin Ecological Services Field Office, and several tribal leaders. NNSA announced the availability of the draft EA and invited comment on its NEPA Reading Room website, in advertisements in the Beloit Daily News on weekdays from July 23 through August 3, 2012, and in letters sent to additional tribal representatives. In addition, NNSA provided both electronic and hard copies for public review at the Beloit Public Library in Beloit, Wisconsin. Although the public comment period ended August 6, 2012, NNSA continued to check for comments through August 10, 2012. NNSA received no comments on the draft EA; the only external inputs were the previously mentioned consultation letters from the Wisconsin SHPO and USFWS.

Copies of the final EA and this FONSI are available on NNSA's electronic NEPA Reading Room (http://nnsa.energy.gov/nepa), DOE's NEPA website (http://energy.gov/nepa), or by sending a request to:

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DETERMINATION: The proposed action is for NNSA is to provide financial assistance to NorthStar in a cost-sharing arrangement under a cooperative agreement to accelerate the establishment of commercial production of Mo-99 using accelerator technology, in the United States and without the use of HEU. On the basis of the evaluations in the final EA, NNSA determined that the proposed action would have no significant impact on the human environment within the meaning of the National Environmental Policy Act. Therefore, preparation of an environmental impact statement is not required, and NNSA is issuing this FONSI.

Issued in Washington, District of Columbia, this 24 day of August 2012.

Anne M. Harrington
Deputy Administrator
For Defense Nuclear Nonproliferation