Uranium Study: Initial Report
Commonwealth of Virginia

Department of Environmental Quality
Department of Mines, Minerals and Energy

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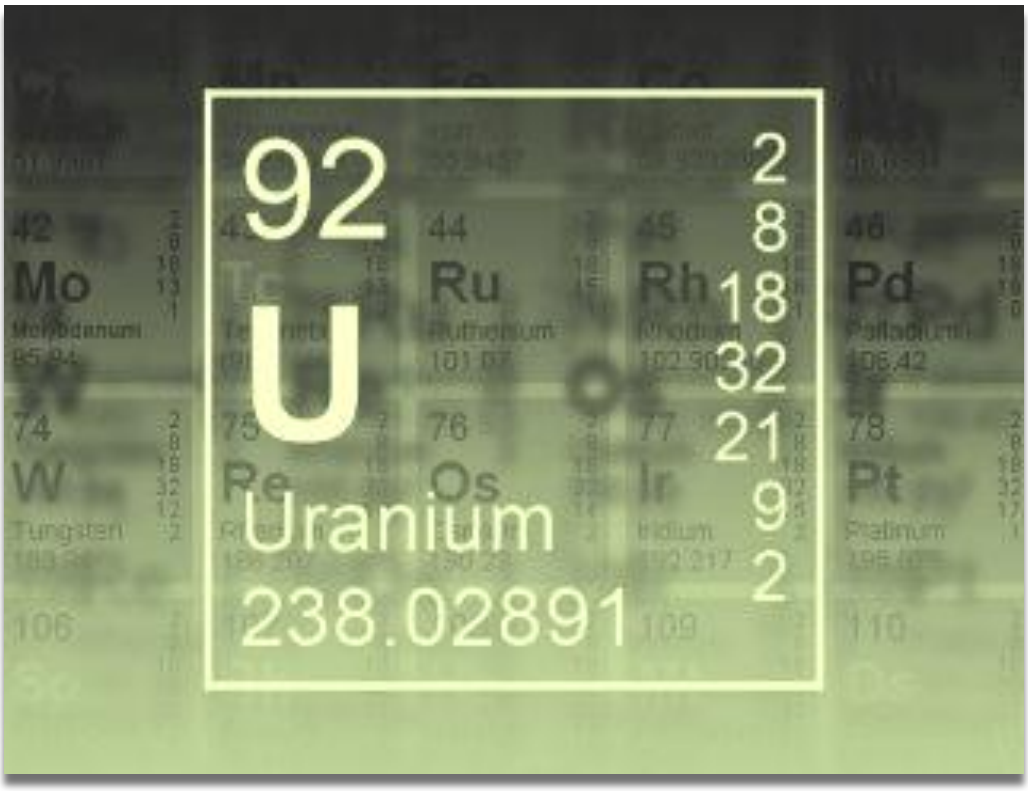

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EXECUTIVE SUMMARY

ES 1.0 Introduction

This initial report is developed in response to the requirements of Work Task A identified in the Virginia Department of Environmental Quality (DEQ) contract No. EP881027, which was awarded on May 21, 2012. The information within this report is intended to assist the Uranium Working Group in developing a scientific policy analysis related to potential future uranium mining in the Commonwealth of Virginia. This report does not provide specific recommendations regarding the question of whether or not uranium mining can be safely practiced in Virginia.

On January 19, 2012, the Governor of the Commonwealth of Virginia (the Commonwealth) directed members of his cabinet to form a Uranium Working Group (UWG) with staff from the Department of Mines, Minerals and Energy (DMME), the Department of Environmental Quality (DEQ), and the Virginia Department of Health (VDH). This UGW was established to:

" ...provide a scientific policy analysis to help the General Assembly assess whether the moratorium on uranium mining in the Commonwealth should be lifted, and if so, how best to do so."

Recent studies on uranium mining in Virginia have identified important issues related to protection of public and occupational health and safety, and associated potential environmental and socioeconomic impacts. Consequently, the UWG has sought to develop a conceptual regulatory framework that would address these issues and any other issues identified by the UWG, the public, or other stakeholders. This conceptual regulatory framework would form part of the Departments' policy analysis and will be one of the many pieces of information the General Assembly would consider while deciding whether or not to lift the Commonwealth's moratorium on uranium mining.

In order to help respond to this directive, the UWG issued two requests for proposal (RFP) to solicit expert advice and analysis of uranium mining issues in Virginia relevant to the statutory jurisdictions of DEQ, DMME and VDH (the Departments). Due to the different areas of focus and responsibilities of the agencies within the UWG, two procurements were developed; one to address the areas of responsibility related to the DEQ and DMME, and one to address areas of responsibility related to VDH.

On March 2, 2012, the DEQ issued the first of these procurements, RFP # 12-06-PJ (Uranium Study). Sealed bids were submitted by April 3, 2012 and contract EP881027 was awarded to Wright Environmental Services on May 21, 2012.

The team assembled by Wright Environmental Services consists of a diverse group of highly experienced and qualified individuals from a variety of backgrounds. The team includes recently

retired lead NRC, State and Canadian regulators who were directly responsible for regulation of uranium mining and/or milling in their respective organizations. In addition, the team includes internationally recognized radiation health physicists and a radioecologist with more than 100 years of combined experience. Further, the engineering expertise within the team includes individuals who assisted NRC in developing their early regulations and individuals who have recent experience and expertise with design of mines and mine waste management systems across the country.

The Contract identifies two major work Tasks (A and B). Work Task A involves the development of an initial report based on:

1) a review of studies related to uranium mining and milling in Virginia,
2) a comparison of other existing regulatory programs for uranium mining, and
3) a review of related emerging standards from international organizations.

Work Task B involves ongoing technical advice and assistance to the UWG. The efforts of Work Task B will result in a series of interim reports analyzing a range of issues identified in the RFP as well as other issues identified by the UWG. These reports will provide additional detail concerning identified issues, including the issues related to potential uranium milling in the Commonwealth, and will elaborate on the points for consideration outlined in this initial report.

These Work Task A and B work products will provide information for the UWG to assist in its development of the requested policy analysis. These work products also illustrate the range of programs that are currently implemented by other State and Federal agencies and provide points for consideration to aid the Commonwealth in any future action to develop a new statute and set of regulations to allow uranium mining.

This executive summary states the purpose and objectives of this Initial Report, summarizes the approach and scope of the literature review (Section 2.0), the comparison of regulatory programs (Section 3.0), and the review of emerging internal standards (Section 4.0) and then summarizes major points for consideration developed from these reviews and comparisons (Section 5.0). More detailed treatment of each subject and the points for consideration are provided in this Report and its Appendices.

ES 1.1 Purpose and Objectives

The purpose of the Initial Report is to respond to the Work Task A requirement in Contract EP881027. The objective of the report is to increase the UWG's understanding of uranium mining regulatory frameworks and emerging international standards through a broad and high-level review of the considered documentation and existing state and federal uranium mining regulatory programs. This effort develops specific considerations for the Commonwealth that are relevant to the existing and potential future regulatory framework in Virginia.

ES 2.0 Literature Review

This review focuses on a limited group of studies and literature that 1) relate most directly to uranium mining in Virginia and 2) may assist the Commonwealth in understanding policies, program elements or program provisions that would be effective and applicable to potential future regulation. Issues related exclusively to uranium milling will be identified and addressed in future reports. Special attention is focused on studies and literature that raised concerns and issues regarding effective control of uranium mining and protection of the environment and human health. There is an extensive body of literature regarding environmental and human health protection associated with uranium mining but its comprehensive review is beyond the scope of this Initial Report. We draw on this focused scope and our combined experience to identify the major issues faced by the UWG and the General Assembly to identify specific points for consideration on these topics.

The studies addressed as part of this review include those identified below. This review focuses on studies and literature that relate most directly to uranium mining and/or milling in Virginia or that may assist the Commonwealth in understanding policies, program elements or program provisions that would be effective and applicable to potential future regulation.

1. Chmura Study - The Socioeconomic Impact of Uranium Mining and Milling in the Chatham Labor Shed, Virginia

2. RTI Study - Proposed Uranium Mine and Mill, Coles Hill Virginia: An Assessment of Possible Socioeconomic Impacts.

3. Roanoke River Basin Assoc./Michael-Moran Assoc. Study - Site-Specific Assessment Of The Proposed Uranium Mining And Milling Project At Coles Hill, Pittsylvania County, VA.

4. National Academy of Sciences Study - Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety, and Regulatory Aspects of Uranium Mining and Processing in Virginia.

5. Baker Study - A preliminary Assessment of Potential Impacts of Uranium Mining in Virginia on Drinking Water Sources

6. SENES Study - Assessment of Risk From Uranium Mining In Virginia.

7. National Resource Defense Council Study - Environmental Damage and Public Health Risks From Uranium Mining in the American West

Based on this review, specific points for consideration are developed that are relevant to Virginia's existing regulatory framework or to a potential future framework for uranium mining. The points of consideration are summarized below and are categorized by the following topic areas as identified in the RFP.

- Water Issues
- Air Issues
- Adequacy of Virginia's Water Quality Standards for Groundwater and Surface Water
- Necessary Components of a Full Environmental Impact Analysis
- Standards for the Safe Disposal of Mine Waste
- Engineering Designs and Best Management Practices
- Methods for Addressing Risk of Catastrophic Events
- Methods for Incorporating ALARA
- Identification and Analysis of Life Span Financial Assurance Mechanisms

These topic areas, as well as others that may be identified by the Uranium Working Group with input from Stakeholders and the public will be the focus of more detailed issues analysis reports developed for Work Task B.

A complete summary of key findings from the studies, comments regarding the study findings, and the related points of consideration developed by Wright Environmental Services are provided in Appendix A of this report. A compilation of the points of consideration developed from this literature review, from the comparison of regulatory frameworks, from review of emerging international standards and from the collective experience of the Wright Environmental Services Team are presented in Section 5.0 of this report. A summary of the major points for consideration is presented in Section ES 5.0 of this Executive Summary.

ES 3.0 Comparison of Existing Regulatory Programs

This comparison addresses existing Federal, State, and International uranium mining regulatory programs. From this comparison, points of consideration that are relevant to and could effectively applied in Virginia are developed from those programs. This is not an all-inclusive comparison, as treatment of all existing uranium mining and milling regulatory programs would have been a larger action than the timing for this task allowed. However, the report assesses the programs of most relevance and includes a variety of Federal, State, and International regulatory bodies. In addition, the collective experience of the Wright Environmental Services Team is applied to this issue to provide a set of points for consideration regarding a potential future regulatory framework for uranium mining in Virginia.

U.S. Federal agencies addressed are the Environmental Protection Agency (EPA), and the Mine Safety and Health Administration (MSHA). The Nuclear Regulatory Commission (NRC) has no jurisdiction over uranium mining. State uranium mining regulatory programs from Colorado, Utah, and Wyoming are addressed as well as the uranium mining regulatory program in Canada. Table 3.1 may be used to identify mining regulatory topics and the entities that may exercise regulatory authority over them. The related report sections discuss the Agencies' methods for addressing the topics within their regulatory frameworks.

Uranium mining has traditionally been administrated in a manner essentially the same as other mineral mining, as it developed in response to the U.S. government's quest for materials related to the weapons program. Uranium mining is generally regulated by most states under their mineral mining regulations and MSHA. Most of the public health, occupational health and environmental health standards have been developed by the U.S. EPA, though other agencies such as MSHA may implement the standards. States have developed their individual statutes and regulations to be generally consistent with MSHA and to address engineering and environmental protection aspects of mining within their borders. States have aligned their regulatory programs with the requirements of the federal Clean Water Act and Clean Air Act and/or have been delegated formal authority over those programs by the EPA.

NRC has no jurisdiction over uranium mining. In addition, most mine waste solids (waste rock, overburden, etc.) are exempt from the U.S. EPA hazardous waste regulations in the Resource Conservation and Recovery Act (RCRA). RCRA was amended by adding section 3001(b)(3)(A)(ii), known as the Bevill exclusion, to exclude "*solid waste from the extraction, beneficiation, and processing of ores and minerals*" from regulation as hazardous waste under Subtitle C of RCRA. The federal Mine Safety and Health Administration MSHA (i.e., MSHA) regulates occupational (worker) health and safety for underground and surface mines. Most states, like the Commonwealth of Virginia, have aligned their mine safety regulations with MSHA's.

Virginia prohibits uranium mining and, therefore, has no regulatory basis for its permitting or administration. Virginia's Title 45.1§283 (Mines and Mining/Uranium Mine Permit Applications) states that not only will applications not be accepted but it indicates that a specific new statute must be promulgated to established a program for permitting and oversight of uranium mining. The Departments will draw on information in this report, previous and subsequent reports, stakeholder and public input, as well as their collective experience to develop a policy analysis for the General Assembly.

ES 4.0 Emerging International Standards

Over the past several decades the international community has continued to consider methods and systems appropriate to the oversight of uranium mining and the residues of past uranium development. In particular, the International Atomic Energy Agency, the World Nuclear Association and the International Commission on Radiological Protection have developed a number of publications focused on environmental and human health protection and best practices associated with uranium production. This section of the Initial Report identifies key issues for consideration raised by these international organizations, and provides summaries of best practices recommended by the groups of experts assembled in recent years by these organizations.

ES 5.0 Summary of Points for Consideration

Points of consideration are developed for the DEQ and DMME based on the literature review, comparison of regulatory programs, assessment of emerging international standards, and how they are relevant to the Commonwealth of Virginia. The points of consideration are segregated by topic area related to the issues identified in the RFP for future analysis. Additional issues may be identified by the UWG with input from stakeholders and the public.

The following points for consideration are not intended to suggest a preferred approach to potential future uranium mining regulation. Rather, they are intended to assist the Departments in scoping a conceptual regulatory framework that might be appropriate should the General Assembly decide to lift the existing moratorium. This conceptual framework is expected to be useful for communicating information concerning potential statutory requirements.

The following points of consideration are condensed from the complete materials presented in the report. These points for consideration will inform subsequent issues reports to be developed as part of this study.

POINTS OF CONSIDERATION:

General:

- Address ways to clearly define and empower respective agencies for permitting, oversight, coordination and enforcement of the various aspects of mining activities.
- Address other agency (state and federal) mandates and authorities to minimize overlap, redundancy and conflicts.
- Address methods for ensuring full management of all potentially harmful aspects of uranium mining.

Water Issues:

- Address baseline characterization requirements from various state, federal and international programs.
- Address operational and post closure/reclamation protection elements from various state, federal and international programs.
- Address appropriate hydrologic siting criteria for potential projects.
- Address resource protection and assessment of risks (potential likelihood and impact).
- Address surface water/groundwater management, monitoring and resource protection programs for all phases of project life cycle.
- Address potential water quality parameters and standards.

Air Issues:

- Address a range of air quality, meteorological data collection, and radiological baseline characterization requirements.

- Address appropriate modeling of primary and secondary transport media for potential radiological and non-radiological hazards.
    - Consider periodic application of site-specific data for permitting model verification/validation.
    - Consider how modeling results are to be assessed and used to allow or require appropriately permit modifications.

Necessary Components of a Full Environmental Impact Analysis

- Address authority and scope of environmental assessment processes.
- Address timing of baseline studies, impact analyses, submittals and public input.
- Address federal NEPA process as a potential model.
- Address criteria for determining whether any or additional environmental assessment is warranted (i.e., when FONSI, EA or EIS).
- Address the range and methods of public engagement, public comment, and comment response.

Standards for the Safe Disposal of Mine Waste

- Address a range of operations and reclamation solid mine waste management requirements (overburden, top soil waste rock).
- Address characterization/testing of overburden and waste rock for the potential for acid generating potential and constituent mobility as they may relate to environmental impacts.
- Address a range of liquid mine waste management requirements (storm water, mine dewatering, grey water).
- Address probable ways to remediate transportation of constituents including liners, covers, barrier systems, and collection.
- Address a range of options for mitigation of contaminants from mining sources to both groundwater and surface water.

Engineering Designs and Best Management Practices

- Address hydrologic siting criteria for potential mines and associated facilities.
- Address range of operational and long-term waste isolation design requirements and practices.
- Address operational and long-term waste monitoring requirements and practices.
- Address ecological risks from loading and transporting of uranium product and chemicals.
- Address engineering controls and good management practices to minimizing impacts of accidents or natural disasters.
- Address hydrologic siting criteria for potential mines and associated facilities.
- Address range of operational and long-term waste isolation design requirements and practices.
- Address engineering and institutional controls to reduce the exposure for humans and aquatic and terrestrial biota.

Methods for Addressing Risk of Catastrophic Events

- Address a range of design bases (i.e., magnitude, intensity, duration, return interval) for catastrophic events (seismic, meteorological, hydrologic)
    - Also applies to Standards for Safe Disposal of Mine Waste
    - Also applies to Engineering Designs and Best Management Practices
- Address methods of risk assessment to analyze the probability of occurrence for human health and environmental impact for the facility and adjacent areas.
- Address methods to determine vulnerability for terrorism, vandalism, and trespass.
- Address methods to determine the probability of accidents related to loading, off-loading, transportation, spills, and review appropriate training, emergency response and clean up.
- Address requirements for applicants to evaluate risks (potential likelihood and impact) of critical project waste management and effluent stream components on natural resources as well as human and ecological receptors.

Methods for Incorporating ALARA

- Address a broad range of guidance for ALARA process implementation including federal and international guidance (i.e., NRC, ICRP, IAEA).
- Address the methods for effective implementation of the ALARA principles (justification, optimization, and dose limitation).

Identification and Analysis of Life Span Financial Assurance Mechanisms

- Address a range of financial funding mechanisms for ensuring adequate and stable, long-term agency funding for oversight, inspection and enforcement.
- Address cost recovery bases for programmatic contingency funding (clean up) not tied to or necessarily derived from the general treasury.
- Address acceptable methods of establishing the amount of the financial assurance.
    - Also address periodic updates of the amount.
- Address criteria for determining release or termination of the financial assurance.
    - Also include public input into the release of funds process.
- Address range of other financial assurances for conditions that require very long-term or perpetual treatment.