TESTIMONY OF WILLIAM SCHNEIDER, JR.

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On H.R. 3405 (*Removing Uranium from the Critical Materials List Act*), a bill to direct the Secretary of the Interior to revise the Final List of Critical Materials and for other purposes

"Uranium Mining: Contamination and Criticality,"

Before the Committee on Natural Resources
Subcommittee on Energy and Mineral Resources

US House of Representatives

June 25, 2019

Mr. Chairman and Distinguished Members of the Committee:

I am grateful for the opportunity to appear before this Committee and provide information to support its deliberations on pending legislation.

I am William Schneider, Jr., a Senior Fellow at the Hudson Institute in Washington, DC. I am a national security specialist and have served in a variety of capacities in the Federal government related to national security programs, technologies, policies, and budgets.[1]

My comments here will be limited to addressing the national security implications of selected provisions of HR 3405, ***The Removing Uranium from the Critical Minerals List Act*** (*To direct the Secretary of the Interior to revise the Final List of Critical Materials and Minerals and for other purposes*). These comments build on my involvement in matters pertaining to the civil and military applications of atomic energy but are my own and do not necessarily reflect the views of any private organization, government agency, or entity.[2]

The scope of national security concerns

The scope of national security concerns has widened significantly since the end of the Cold War. "National Security" was the integrated product of diplomacy and national defense as a result of the creation of the Department of Defense, the Joint Chiefs of Staff, and the National Security Council. President Truman signed the legislation creating these institutions in *The National Security Act of 1947*. The statute mandated the restructuring of the US government's diplomatic and national defense institutions to meet the challenges of the Cold War.[3] As was the case throughout the Cold War, the US homeland was a sanctuary from which the US could reinforce its diplomatic leadership of a strong and committed alliance structure to conduct expeditionary campaigns from the US and bases abroad anywhere in the world.

The post-Cold War phenomena of the globalization of the international economy, the reduction in international barriers to the transfer of technology, and the development of the internet and new forms of communication has fundamentally altered and broadened the scope of national security. The concept of national security now includes not only traditional diplomacy and defense policy and operations; it also includes the need to protect the homeland and its ability to survive and operate in the face of existential threats that did not exist a quarter-century ago.

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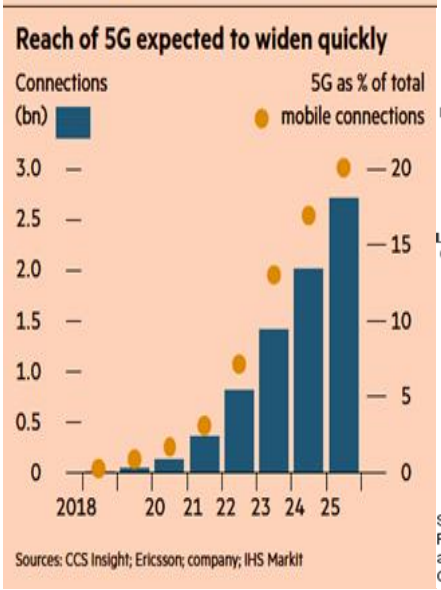
[1] I have previously served in the Executive Branch of the Federal government as Associate Director for National Security and International Affairs in the ***Office of Management and Budget*** (1981-2), Under Secretary of State, ***US Department of State*** (1982-86), Chairman of the ***General Advisory Committee on Arms Control and Disarmament*** (Arms Control & Disarmament Agency, 1987-93), and Chairman of the ***Defense Science Board*** (DoD, 2001-9).

[2] I served as a Member of the ***Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise: A New Foundation for the Nuclear Enterprise*** [2014]; http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf?_ga=1.83182294.1320535883.1415285934 and co-chaired the Defense Science Board's recent study of weapons of mass destruction, ***Deterring, Preventing, and Responding to the Threat or Use of Weapons of Mass Destruction–Executive Summaries*** (U) [2018]; https://www.acq.osd.mil/dsb/reports/2010s/DSB%20WMD%20Executive%20Summaries_FINAL.pdf

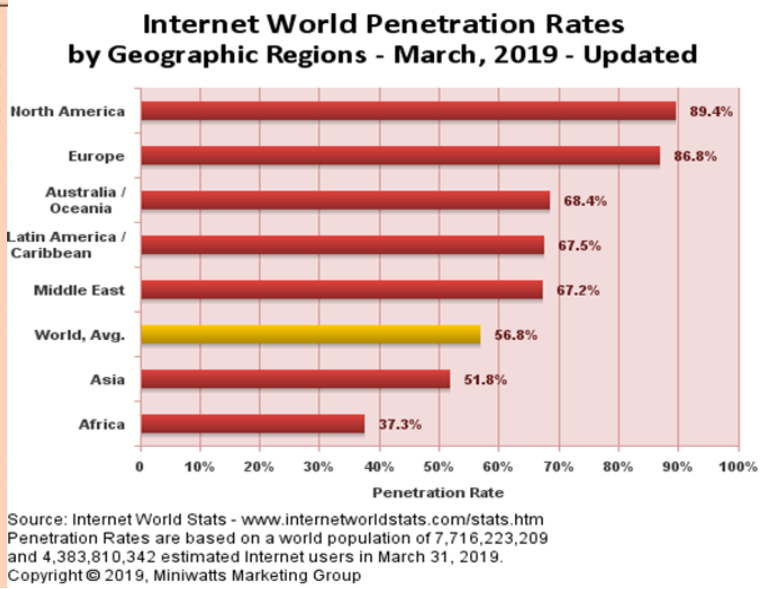
[3] Office of the Historian, ***The National Security Act of 1947***, US Department of State; https://history.state.gov/milestones/1945-1952/national-security-act

Globalization has facilitated the transnational spread of terrorism at a scale that dwarfed our expectations formed in the 1960s and '70s by small bands of terrorists.[4] Moreover, the 'democratization' of technology access facilitated by the global deregulation of the transfer of technology meant that small terrorist organizations were able to share access to the same technology base as was available to nation-States.

The globalization telecommunications as shown in the graphics below have gone hand-in-hand with the growth of terrorist movements to enable them to conduct highly destructive operations on a global scale. China's efforts to propagate its 5th generation telecommunications technology will, if widely adopted by the ~ 100 nations affiliated with its Belt-and-Road-Initiative infrastructure project – two thirds of the world's population – will materially strengthen the ability of international terrorist entities to communicate and coordinate their activities.[5] By 2025, industry forecasts anticipate that 20% of mobile connections will be made with China's 5th generation mobile communications technology.



Source: ***Financial Times***



Source: https://www.internetworldstats.com/stats.htm

Similarly, the swift development and globalization of access to the internet – materially abetted by mobile communications – has become a profound challenge to US national security interests. The access to the internet has reached nearly 60% of the world's population and the growth rate of its penetration of global markets is accelerating. While this development has created extraordinary benefits on the international economy, it has also had a powerful effect on US national security interests.

Cyber operations are borderless, but can destabilize an economy, or attack individuals. Cyber operations can imperil military operations and bring a government to its knees. When integrated with other kinetic

[4] Brian Jenkins, ***The 1970s and the Birth of Contemporary Terrorism***, July 30, 2015, RAND Corporation; https://www.rand.org/blog/2015/07/the-1970s-and-the-birth-of-contemporary-terrorism.html

[5] Andreea Brînză, ***Redefining the Belt and Road Initiative***, March 20, 2018, *The Diplomat*; https://thediplomat.com/2018/03/redefining-the-belt-and-road-initiative/

and non-kinetic military operations, cyber operations serve as a powerful adjunct to the preparation for armed conflict as well as an instrument of military operations. The scale and character of the threat posed by cyber operations and its low barriers to entry has rendered operational distinctions between "national" and "international" activities moot.

Hence, the concept of "national security" has evolved to include the protection of the nation's critical infrastructure which is an enabler of both the survival of the social order and economy of the nation as well as its ability to conduct military operations. The incorporation of the nation's critical infrastructure as part of the broader scope of "national security" has been established in law under the Department of Homeland Security (DHS). In Presidential Policy Directive 21 (PPD-21), President Obama has identified 16 sectors within the nation's critical infrastructure.[6] Among the sixteen sectors is one encompassing "Nuclear Reactors, Materials and Waste Sector". The nuclear sector is on an equal footing with the Defense Industrial base affirming in public policy both its criticality to sustaining the nation's critical infrastructure and its coupling to national security.

The changes in technologies that have produced revolutionary changes in the scope and content of the notion of "national security" may be subject to further acceleration as new technologies affect both national defense and our ability to protect the homeland. For example, the technologies of biology, data sciences, computation, etc. are in many cases, in early stages of their development and their application to national security.

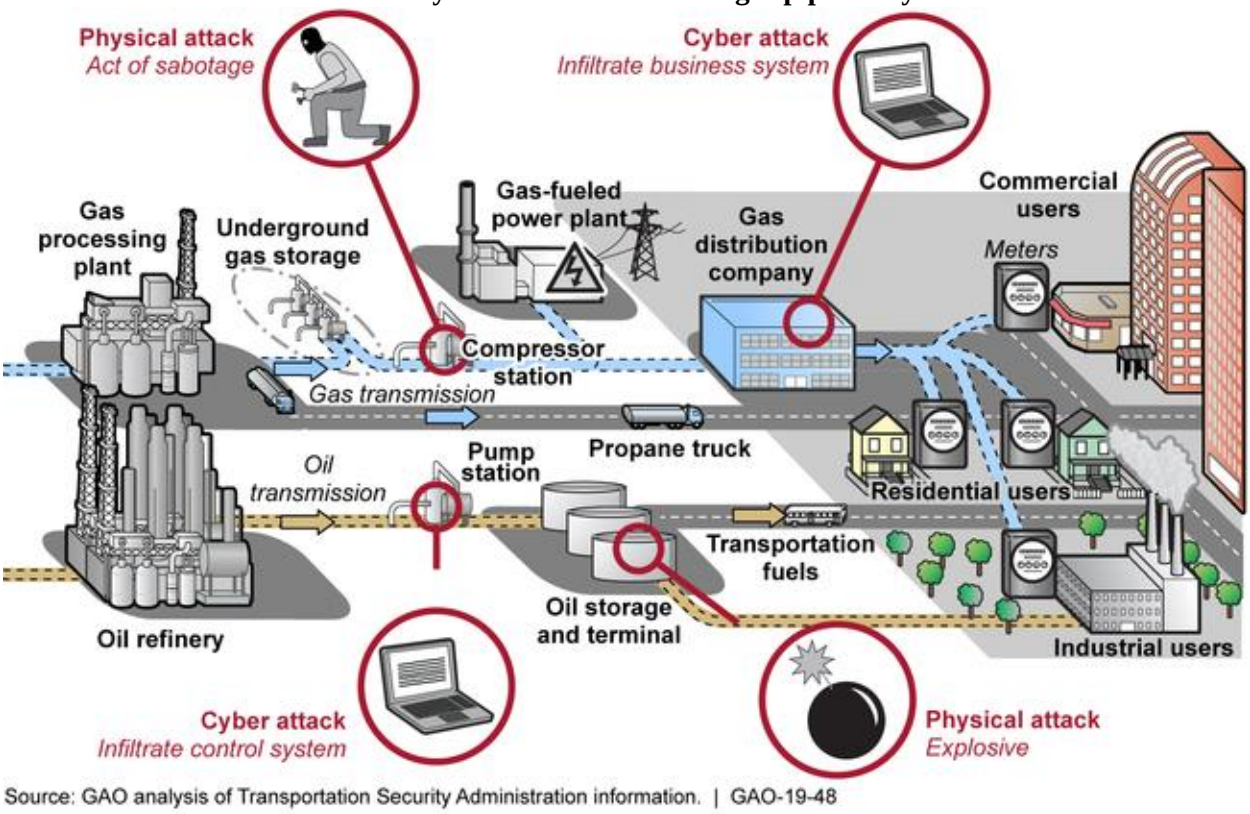
The national security implications of uranium

Uranium has a unique role in US in relation to its role in the critical infrastructure of the US. Uranium is the source of fuel for nuclear power plants that provide nearly 20% of the base load for the US electric power system and unlike oil and gas, can do so without dependence on the national pipeline infrastructure. The pipeline infrastructure is vulnerable to both sabotage and adversary cyber operations as a recent GAO study has noted.[7] A cyber-attack was conducted last year by an unknown adversary on four US natural gas pipeline operators. Similar transportation vulnerabilities exist elsewhere in the national energy system. The energy supply for nuclear power plants are held *in situ* and hence do not share this vulnerability. The figure below drawn from the GAO review of the vulnerability of the pipeline system is displayed below.

[6] Department of Homeland Security, ***CISA: Critical Infrastructure Sectors***; https://www.dhs.gov/cisa/critical-infrastructure-sectors **,** ***Presidential Policy Directive – 21, Critical Infrastructure Security and Resilience***, February 12, 2013; https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil

[7] General Accountability Office, ***CRITICAL INFRASTRUCTURE PROTECTION: Actions Needed to Address Significant Weaknesses in TSA's Pipeline Security Program Management,*** GAO-19-48: Published: Dec 18, 2018. Publicly Released: Dec 19, 2018. A cyber-attack on four US natural gas pipeline operators is described in Clifford Krauss, ***Cyberattack Shows Vulnerability of Gas Pipeline Network****, New York Times,* April 4, 2018; https://www.nytimes.com/2018/04/04/business/energy-environment/pipeline-cyberattack.html

Vulnerability of the national oil and gas pipeline system



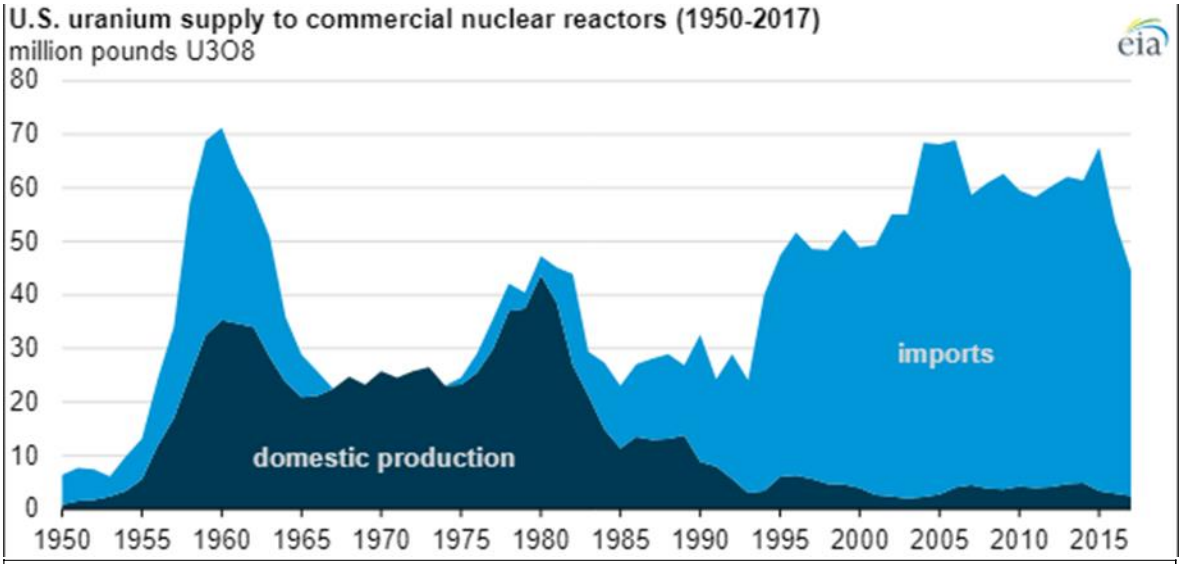
Source: GAO analysis of Transportation Security Administration information. | GAO-19-48

Associated vulnerability of the seaborne transportation of oil and gas transported can be assumed since the pipeline network is needed to transport oil and gas from ports to its point of use. The aim expressed in PPD-21 is to create a resilient system sustaining energy production and distribution by employing a primary fuel mix as well including renewable sources providing intermittent power. Moreover, in an environment where public policy seeks low carbon footprint energy sources, the ability to maintain a zero-carbon source able to supply base-load (i.e. non-intermittent) power at scale has been reinforced by President Obama's decision to incorporate civil nuclear energy in the US critical infrastructure list.

Uranium is a relatively scarce element in the earth's crust – about 4 parts per million. The largest producer is Kazakhstan, though its operations and exports remained controlled by Russia. Control of the uranium sector is part of a broader Russian effort to dominate the global nuclear energy market; an effort abetted by its intensified collaboration with China following the Putin-Xi summit meeting in June 2019.[8] China's BRI infrastructure provides a ~ 100-nation marketing platform for the extension of Russia's nuclear energy aspirations.

[8] Senators Mike Crapo and Sheldon Whitehouse, ***US Nuclear Energy Leadership: Innovation and the Strategic Global Challenge,*** May, 2019, Atlantic Council, Washington, DC; https://www.atlanticcouncil.org/images/publications/US_Nuclear_Energy_Leadership-.pdf, ***Russia Unrivaled in Nuclear Power Exports: A 60% Share of the International Market Has Boosted Moscow's Diplomatic Clout,*** *Japan Times,* July 27, 2017; https://www.japantimes.co.jp/opinion/2017/07/27/commentary/world-commentary/russia-unrivaled-nuclear-power-plant-exports/#.XQ-Y7OhKg3s. ***ROSATOM, Russia, China Sign Several Major Nuclear Contracts in the Nuclear Sphere***, June 8, 2018 https://www.rosatom.ru/en/press-centre/news/russia-china-sign-several-major-nuclear-contracts-in-nuclear-sphere-/

The consequences of Russia's efforts to implement its aspirations are appearing in the data published by the US Energy Information Agency. These data reveal the collapse in US domestic production of uranium for commercial nuclear reactors as displayed in the chart below.



Source: U.S. Energy Information Administration, *Monthly Energy Review* and *Uranium Marketing Annual Report*
https://www.eia.gov/todayinenergy/detail.php?id=39352

While predatory pricing behavior in support of Russia's global commercial aspirations is characteristic of these circumstances, consideration also needs to be given to Russia's practice of manipulating its exports for political or diplomatic purposes. Two recent episodes illustrate the issue.

→ ***Russia's restrictions on the export of its RD-180 rocket motors to the US***

In 2014, Russia announced that it would no longer provide its RD-180 rocket motor to the US that would be used for military space launches. This decision was taken as bilateral relations deteriorated following the failure of the US diplomatic initiative to improve bilateral relations, the "Russian re-set".[9] This decision has imposed a cost of several billion dollars to develop and produce a replacement.

→ ***Russia's manipulation of natural gas deliveries to Ukraine***

Russia has sought to pressure Ukraine's independent government to downgrade its efforts to improve diplomatic and commercial relations with the US and the European Union. It has done so through the manipulation of natural gas deliveries to Ukraine at crucial moments. While the Russian initiative has been widely criticized, manipulation of exports remains a core element of Russia's method for the propagation of its diplomatic and commercial interests.[10]

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[9] Jeff Foust, ***Russian official announces ban on military use of RD-180 engines (updated),*** *Space Politics,* May 13, 2014; http://www.spacepolitics.com/2014/05/13/russian-official-announces-ban-on-military-use-of-rd-180-engines/

[10] European Parliament, ***Energy as a tool of foreign policy of authoritarian states, in particular Russia,*** Directorate for External Policies of the (European) Union, April, 2018; http://www.europarl.europa.eu/RegData/etudes/STUD/2018/603868/EXPO_STU(2018)603868_EN.pdf

Alternative sources of supply of uranium to Russia/Kazakhstan are available on the international market, particularly Australia, Canada, and Namibia. However, these producers are similarly exposed to the risk of the pricing models employed in the marketing of uranium by Russia/Kazakhstan. The public policy question for the US at issue is one of balancing risks. Should the nuclear power industry, defined in law and policy as an element of the "critical infrastructure" component of the United States national security establishment, continue to be significantly dependent on its enabling fuel – uranium – from foreign producers in a market heavily influenced by an adversary State?

The national defense implications of uranium

The military applications of atomic energy have been the core element of US national security policy since 1945. The Nuclear Non-Proliferation Treaty (NPT) of 1968 has been at the center of US efforts to prevent the spread of nuclear weapons and related technologies. In doing so, the US and its allies have enjoyed some important successes; of the 24 States that sought to develop or acquire nuclear weapons since 1945, only 4 have done so.

However, the restraints on nuclear proliferation have begun to erode as two of the nuclear States under the NPT – China and Russia have embarked on nuclear modernization programs that will result in a fielded nuclear force larger than either deployed during the Cold War. Similarly, the commitment of China and Russia to maintaining non-proliferation norms concerning nuclear weapons and delivery system technology have significantly diminished as it has served their foreign policy interests to facilitate the nuclear weapons and long-range missile programs in Iran, North Korea, and Pakistan.

→ China has provided Pakistan with weapons-grade nuclear material and nuclear weapon design information that has enabled Pakistan to field a nuclear force as large as France.[11]

→ China and Russia have facilitated North Korea's nuclear weapons and weapons delivery systems. Their assistance has included facilitating the evasion of UN sanctions on their nuclear weapons testing program, the provision of Russia's R-27 (NATO designation: SS-N-6 *Serb*) submarine launched ballistic missile design which was copied for the North Korean *Hwasong* 10/Musudan BM-25 and the *Hwasong 12* intermediate-range ballistic missile ("Guam Killer"). China has aided elements of North Korea's mobile ballistic missile programs.[12]

→ China's nuclear weapons modernization program has resulted in the fielding of ten times the number of nuclear weapons it fielded during the Cold War.[13]

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[11] National Security Archive, ***The Pakistani Nuclear Program***, June 23, 1983 [Declassified CIA intelligence estimate]; https://nsarchive2.gwu.edu/NSAEBB/NSAEBB114/chipak-11.pdf

[12] Elizabeth Wishnik, ***The Impact of the Sino-Russian Partnership on the North Korean Nuclear Crisis,*** National Bureau of Asian Research, March, 2019; https://www.nbr.org/publication/the-impact-of-the-sino-russian-partnership-on-the-north-korean-nuclear-crisis/

[13] **Defense Intelligence Agency**, ***China Military Power: Modernizing a Force to Fight and Win***, January 2019; https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/China_Military_Power_FINAL_5MB_20190103.pdf, and Steve Chen, ***China Steps Up Pace in New Nuclear Arms Race with US and Russia as Experts Warn of Rising Risk of Conflict***, *South China Morning Post*, May 28, 2018; https://www.scmp.com/news/china/society/article/2147304/china-steps-pace-new-nuclear-arms-race-us-and-russia-experts-warn

→ On December 22, 2010, the US Senate ratified the signature diplomatic achievement of President Obama's term in office; the New START arms control agreement. Upon its ratification, the President stated that the agreement "will make us safer and reduce our nuclear arsenals along with Russia".[14]

A week later, on December 31, 2010, Russian President Dmitry Medvedev announced Russia's State Armament Program for 2011-2020. This programmatic and budgetary initiative seeks to recapitalize Russia's entire Cold War inventory of nuclear weapons and delivery systems for both "strategic" nuclear weapons (i.e. those controlled by bilateral agreements with the US), and "sub-strategic" weapon systems (i.e. all other nuclear weapons and associated delivery systems). The latter are more numerous – approximately 2,000 weapons delivered by a variety of terrestrial, maritime, and air launched systems. In addition, there are an unspecified number of nuclear warheads used in Russia's air and missile defense systems.[15] The resulting nuclear force will be larger and more capable than the Cold War force it replaces including new types of nuclear weapons.

→ The Director of the Defense Intelligence Agency, Lt. Gen. Robert Ashley stated in May 2019 that "the United States believes that Russia probably is not adhering to its nuclear testing moratorium in a manner consistent with the 'zero-yield standard" and is "probably conducting nuclear tests".[16]

→ On March 1, 2018, President Putin announced six major new nuclear weapons development programs that are not covered by New START or other arms control programs. Russia has also withdrawn from the 1987 Intermediate Nuclear Forces Treaty after refusing to end its non-compliance following five years of efforts by both the Obama and Trump administrations to persuade Russia to comply.[17]

While these developments do not necessarily call for any specific set of measures on the part of the US, they do underscore the fact that the global national security environment when taking all factors into account has changed in fundamental ways from our early post-Cold War expectations. Moreover, the effectiveness of nuclear arms control measures as an instrument to manage the strategic competition between the US and Russia has been sharply diminished. Despite US diplomatic efforts to bring China in the Russian American arms control process,

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[14] ***President Obama's news conference***, December 22, 2010; https://obamawhitehouse.archives.gov/the-press-office/2010/12/22/news-conference-president

[15] DIA, ***Russia Military Power: Building a Military to Support Great Power Aspirations*** (2017); https://www.dia.mil/portals/27/documents/news/military%20power%20publications/russia%20military%20power%20report%202017.pdf

[16] Michael R. Gordon, ***US Says Russia Likely Conducting Low-Yield Nuke Tests, Defying Test Ban Treaty,*** *Wall Street Journal,* May 29, 2019; https://www.wsj.com/articles/u-s-says-russia-likely-conducting-low-yield-nuke-tests-defying-test-ban-treaty-11559135102

[17] Joseph Trevithick, ***Here's the Six Super Weapons Putin Unveiled During Fiery Address,*** *The Drive,* March 1, 2018; https://www.thedrive.com/the-war-zone/18906/heres-the-six-super-weapons-putin-unveiled-during-fiery-address

China has sustained its half-century old posture of refusing to participate in nuclear arms control arrangements with the United States.

During the Cold War, the number of US nuclear weapons had declined by more than 80% from their peak of 35,000 under President Lyndon Johnson in 1967. By the time President George W. Bush left office in 2009, less than 5,000 remained – including those for which there was no delivery system. The stark reduction in the number of nuclear weapons reflected the fielding of new conventional weapons technology in the 1980s that undermined the credibility of Soviet military power in Europe. President Reagan's decision to develop defenses against ballistic missiles also contributed to the diminished role of nuclear weapons in US foreign policy. The successive US post-Cold War administrations sought to further reduce the number of nuclear weapons and increase transparency. The prospects for doing so have declined.

The nuclear enterprise supporting the national defense function is a very long-cycle enterprise. It was designed an optimized for Cold War circumstances and was down sized to meet post-Cold War hopes. The US leadership now faces a nuclear revival involving four adversary nuclear States where Cold War-derived doctrines of deterrence no longer obtain. Facing an "all-azimuths" threats, both before and following the commencement of hostilities, planning for future contingencies is changing radically.

For example, the DoD has revived its effort to field micro-nuclear reactors to supply electric power to military bases in response to the likelihood that the US power grid will be the subject of adversary sabotage and cyber operations.[18] This capability could be the forerunner of the creation of a national capability to mitigate the consequences of a devastating attack on the US critical infrastructure.[19]

Both China and Russia have reversed course from there early post-Cold War posture and have increased the role of nuclear weapons in their foreign policy and have invested heavily in creating significantly larger strategic and sub-strategic nuclear forces. In 2014, Russia announced that it is now prepared to use nuclear weapons in a conventional conflict, the expanding rather than diminishing the scope of potential nuclear conflict.[20] The issue going

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[18] Nuclear Energy Institute, ***Roadmap for the Deployment of Microreactors for US Department of Defense Domestic Installations***, October 2018; https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/Road-map-micro-, reactors-department-defense-201810.pdf, and Jeff Waksman, Program Manager, ***Project Pele Overview: Mobile Nuclear Power for Future DoD Needs***, Strategic Capabilities Office, DoD, May 2019

[19] The recent collapse of the power grid serving Argentina and adjacent countries left 55 million people without electric power for more than a week. The source of the outage was the failure of two electrical devices associated with the safety system for the grid. The cause of the failure is unknown. Luis Andres Henao and Paul Byrne, ***Blackout in South America Raises Questions About Power Grid***, *Washington Post*, June 17, 2019; https://www.washingtonpost.com/business/hunt-for-cause-of-massive-south-america-power-outage-begins/2019/06/17/614ecc8e-90ba-11e9-956a-88c291ab5c38_story.html?utm_term=.1260f5a03955

[20] ***The Military Doctrine of the Russian Federation***, Approved by the President of the Russian Federation, December 25, 2014; https://rusemb.org.uk/press/2029

forward is then, do the risks sustain or outweigh the benefits of removing uranium from the *Critical Minerals List Act* as proposed in HR 3405?

Conclusion

Since the end of the Cold War, the US has been disposing of highly enriched uranium that extracted from retired nuclear weapons by down-blending the uranium to low-enriched uranium (LEU; ~ 5%) for use in civil nuclear power reactors. Highly enriched (HEU: > 90%) uranium from weapons stockpiles has been displacing some 8850 tons of U_3O_8 production from mines each year and met about 13% to 19% of world reactor requirements through to 2013.[21]

Doing so was a logical step since it was assumed that the need to build new nuclear weapons that would require additional special nuclear material (including uranium) was highly unlikely following the collapse of the Former Soviet Union. Based on the US-Russian dialog surrounding the negotiation of the New START, President Obama had reason to believe that Russia was equally committed to the elimination of nuclear weapons. No new nuclear weapon designs have been fielded. As we now know, Russia shared no such commitment.

The US has not built any new nuclear weapons since the early 1990s. For example, the existing W79 warhead for the Trident system is being modified simply to reduce its nuclear yield to deter Russian use of low-yield nuclear weapons in a conventional conflict as they have stated in their current nuclear doctrine (2014). The existing B61 bomb uses the same "physics package" since the device was developed in 1963 but has been adapted to permit a low-to-intermediate range of nuclear yields in the 50+ years and improved safety and surety though it has been in the US inventory.

Both China and Russia have developed new types of nuclear weapons that are in series production. The future is too uncertain, and the US dependence on its nuclear weapons posture too fundamental to assume that nothing will change in the future that could affect US requirements for the military applications of uranium.

The increased risk posed to the credibility and resilience of nuclear deterrence as the contours and scale of Russia and Chinas' nuclear modernization became known, and North Korea's emergence as a nuclear armed entity affirms Paul Bracken's observation that we have entered the "second nuclear age".[22] Public policy needs to reflect the reality of the international security environment likely to prevail for the first half of this century.

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[21] World Nuclear Association, ***Military Warheads as a Source of Nuclear Fuel*** (2017), http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/uranium-resources/military-warheads-as-a-source-of-nuclear-fuel.aspx

[22] Paul Bracken, ***The Second Nuclear Age: Strategy, Danger, and New Power Politics***, (New York: St Martins Griffin, 2012)

The consequences of striking uranium from the *Final List of Critical Materials* poses more risks than benefits to the US. The possibility that the US would lose entirely the indigenous capacity to mine and produce uranium is a plausible outcome from such a decision to strike uranium from the list. If indigenous US uranium mining were to be displaced by predatory pricing by an adversary State (Russia), the risks to the US ability to respond to contingencies where it needed to significantly increase the production of nuclear weapons would be an outcome that US Presidents would resist.

The proposed legislation in its present form offers no scope for flexibility in its implementation, thus converting a trade-related initiative to a statutory burden on US national security.