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## Iran developing plutonium-based nuke capability

Source: http://www.homelandsecuritynewswire.com/dr20130228-iran-developing-plutoniumbased-nuke-capability

While the world is focusing on Iran’s enriched-uranium nuclear weapons program, evidence has emerged to show that Iran has embarked on a project to make plutonium-based nuclear weapons. This plutonium weapon project is taking place at a facility from which IAEA inspectors have been barred for eighteen months now. Detailed satellite images show that Iran last month has activated the Arak heavy-water production plant, located 150 miles south-west of Tehran. Satellite images of the area around the Arak facility show that numerous anti-aircraft missile and artillery batteries protect the plant — more such missile batteries than are deployed around any other known nuclear site in Iran.

Over the last decade, tensions between Iran and the international community revolved around Iran’s program to build nuclear weapons based on enriched uranium.

New reports suggest that, more recently, Iran has also embarked on a project which would allow it to build nuclear weapons made of plutonium.

The Telegraph reports that this plutonium weapon project is taking place at a facility from which IAEA inspectors have been barred for eighteen months now.

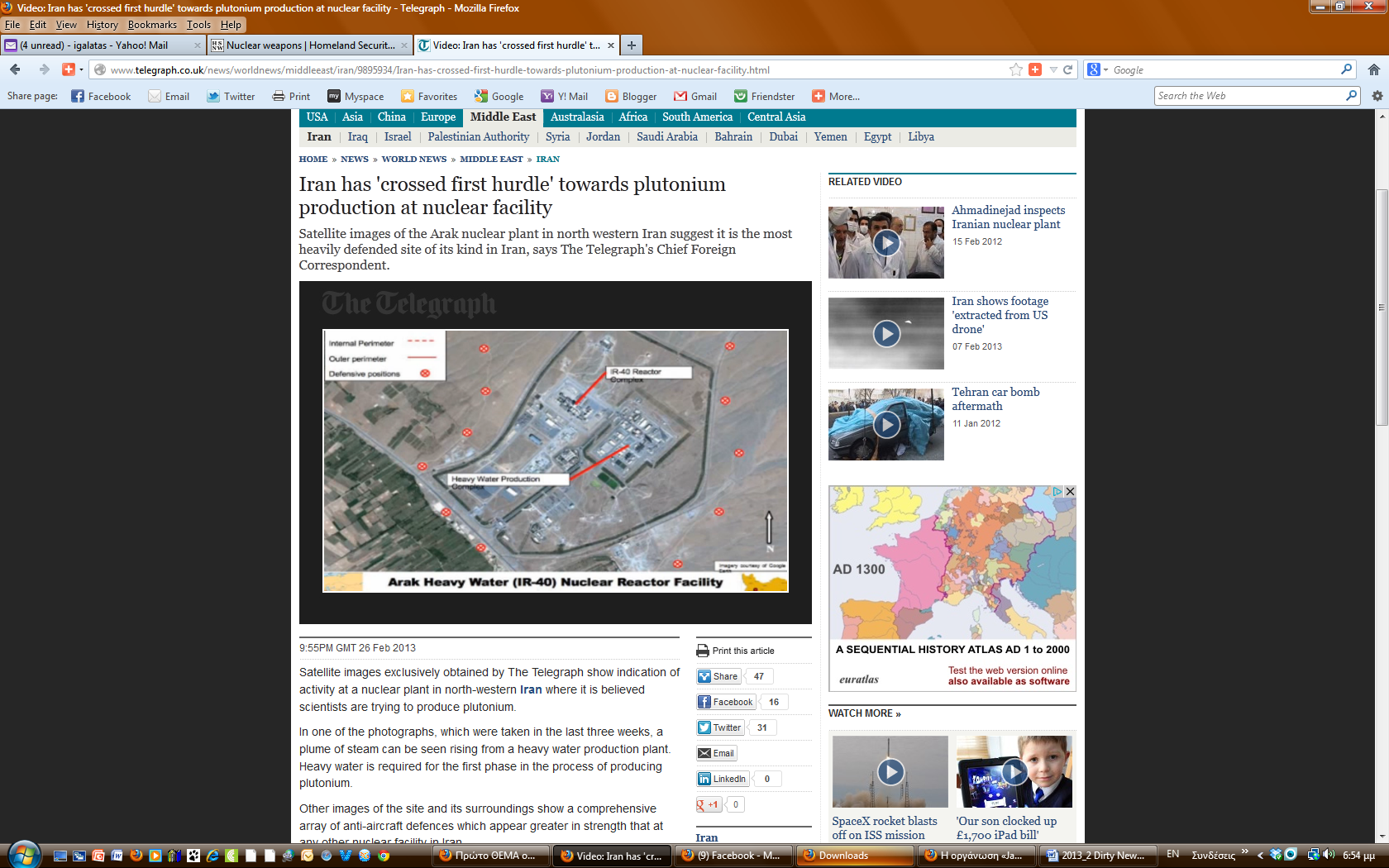
Detailed satellite images show that Iran last month has activated the Arak heavy-water production plant, located 150 miles south-west of Tehran.

Water vapour, circled, is seen being emitted from forced air coolers at the Arak heavy water production plant earlier this month, showing that the facility is operational

Weapon-grade plutonium is extracted in a separation plant from spent uranium rods, and heavy water is used in operating a nuclear reactor that can produce plutonium.

The revelations about Iran’s plutonium bomb project come against the backdrop of yet another round of talks between Iran and six world powers, held Monday and Tuesday in Kazakhstan. The P5+1 group (the five permanent members of the UN Security Council plus Germany) offered Iran a relaxation of economic sanctions in exchange for reduced concessions from Iran – reduced, that is, relative the demands previously made by the P5+1.

The new proposals would:

* Only temporarily to halt, not abandon altogether, uranium enrichment activities at the underground facility at Fodrow
* Allow Iran to keep uranium it has already enriched to 20 percent, rather than ship all of its 20 percent-enriched uranium out of the country
* Demand that the intervals between one IAEA inspectors’ visit to some of Iran’s nuclear facilities be shortened

In exchange, the P5+1 offered Iran:

* Relaxation of some of the economic sanctions now imposed on the country
* No new economic sanctions
* Relaxations of sanctions involving trading in gold and petrochemical products
* Relaxation of some sanctions on Iranian banks
* There will be relaxation of the EU’s oil trading sanctions on Iran

The new information about Iran’s plutonium bomb project indicates that Iran is preparing an alternative to its uranium bomb program. Iran may agree to slow down somewhat its march toward acquiring uranium-based nuclear weapons in order to lessen the onerous burden of the economic sanctions on the country – bu, at the same time, Iran appears to be embarking on a crash program to build plutonium-base weapons.

The Telegraph notes that images of the area around the Arak facility show that numerous anti-aircraft missile and artillery sites protect the plant — more such missile batteries than are deployed around any other known nuclear site in Iran.

The Arak facility consists of two parts: the heavy-water plant and a nuclear reactor. While the heavy-water plant has been closed to inspectors, the reactor has been opened to IAEA inspections.

Iran informed the IAEA that the Arak reactor will begin operation in the first three months of 2014.

Western intelligence services say there is no information that Iran has yet built a separation plant to reprocess plutonium and use it for a weapon.

Mark Fitzpatrick, a former U.S. State Department official at the International Institute for Strategic Studies, told the Telegraph that Arak could be part of a process that might trigger Western strikes on Iran.

One option for the Iranian regime would be to acquire the necessary reprocessing technology from North Korea, he said. “By then, the option of a military strike on an operating reactor would present enormous complications because of the radiation that would be spread,” he said.

“Some think Israel’s red line for military action is before Arak comes online.”

The satellite images obtained by the Telegraph were analyzed by Stuart Ray of McKenzie Intelligence Services, a consultancy firm. He said: “The steam indicates that the heavy-water plant is operational and the extent of the air defense emplacements around the site make it suspicious.”

The Washington, D.C.-based Institute for Science and International Security, if the heavy-water plant reaches full capacity, it would produce about 20lb of plutonium a year. That could be enough for two nuclear warheads if the plutonium was reprocessed.



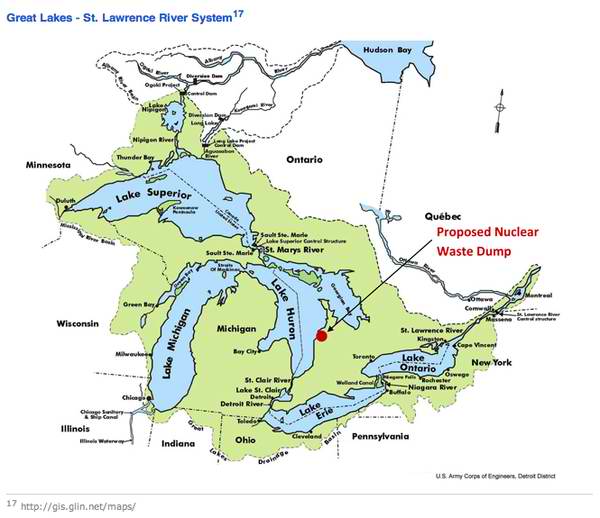
## radiation3The Great Lakes Nuclear Dump: Ontario Power Generation’s Plan to Bury Nuclear Waste on Shores of Lake Huron

**Source: http://www.globalresearch.ca/the-great-lakes-nuclear-dump-ontario-power-generations-plan-to-bury-nuclear-waste-on-shores-of-lake-huron/5324055**

**By Stop The Great Lake Nuclear Dump**

1.     Ontario Power Generation (OPG), a multi-billion dollar corporation wholly owned by the Province of Ontario, plans to build a nuclear waste dump at the Bruce Nuclear Power Plant site, Municipality of Kincardine, Ontario “located approximately 1 km inland from the shore of Lake Huron at the surface and more than 400 metres below the deepest near-site point of Lake Huron.”   <http://tinyurl.com/arc34y2>  , page 55  OPG owns all Ontario’s nuclear plants and all radioactive nuclear waste created.

2.     Low and intermediate level radioactive nuclear waste will be buried in the nuclear waste dump. Intermediate level nuclear wastes are highly radioactive and many remain toxic for over 100,000 years.  Some are as dangerous as nuclear spent fuel.  No scientist or geologist can provide a 100,000 year guarantee that this nuclear waste dump will not leak.

3.     Approval of the nuclear waste dump in the Municipality of Kincardine (DGR1) will set precedents (toxicity of waste, proximity to lake, geology) and smooth the way for the much publicized second underground nuclear waste dump for the  high level nuclear spent fuel involving 21 communities (DGR2).  Kincardine’s DGR1 is the Trojan Horse in our midst.

4.     OPG is paying $35.7million to Saugeen Shores, Huron-Kinross, Arran-Elderslie, Brockton, Kincardine.  All are adjacent to the Bruce Nuclear Power Plant site.  $10.5 million has already been paid even before approval to construct the dump is received.  OPG can unilaterally cancel payment if municipality fails to support the nuclear waste dump proposal. http://tinyurl.com/b2qtcya

5.     40 million people in 2 countries rely on the Great Lakes for drinking water. http://tinyurl.com/aq7q5hw .

6.     OPG’s Environmental Impact Statement document contains 3,432 pages; justification for choosing the Kincardine site is contained in the equivalent of one single page.  OPG’s comment on acceptability of an alternative site option: ”Unknown”. http://tinyurl.com/av6jexb .

7.     An underground nuclear waste dump in limestone is unproven and unprecedented.

8.     Nuclear waste dumps in other countries are leaking. http://tinyurl.com/aup4wwm

9.     OPG’s proposal presently undergoing an Environmental Assessment (EA).  Public hearings expected in the spring of 2013.  EA Joint Review Panel will report to the federal Minister of the Environment, who in turn will report to the Canadian federal cabinet, the ultimate decision maker.  Decision anticipated within 9 months.

10.  Nuclear waste will be buried in the dump over a 35-40 year period.  Ten years of pre-closure monitoring to be followed by unmonitored, unspecified institutional control and then abandonment.

11.   In the words of Rod McLeod, a former Deputy Minister of the Environment (Ontario) “…the OPG proposal is very  unwise.” http://tinyurl.com/amoepsw, Petitioner comment #960

12.  According to William Fyfe, a retired University of Western Ontario professor and an international consultant on nuclear waste ”You do not put nuclear waste near things like the Great Lakes or the great rivers in case there’s a leakage that you haven’t expected.”  http://tinyurl.com/arggzco

13.   OPG states “Taking into account the findings of the EA studies, including the identified mitigation measures, it is OPG’s conclusion that the DGR Project is not likely to result in any significant adverse effects on the environment .”  http://tinyurl.com/av6jexb, pg xv

14.  40 million affected Canadians and Americans situated throughout the Great Lakes Basin that can and will be impacted if things go wrong were not consulted or informed and receive nothing but risk and uncertainty.

# US nuclear forces, 2013

**By Hans M. Kristensen and Robert S. Norris**

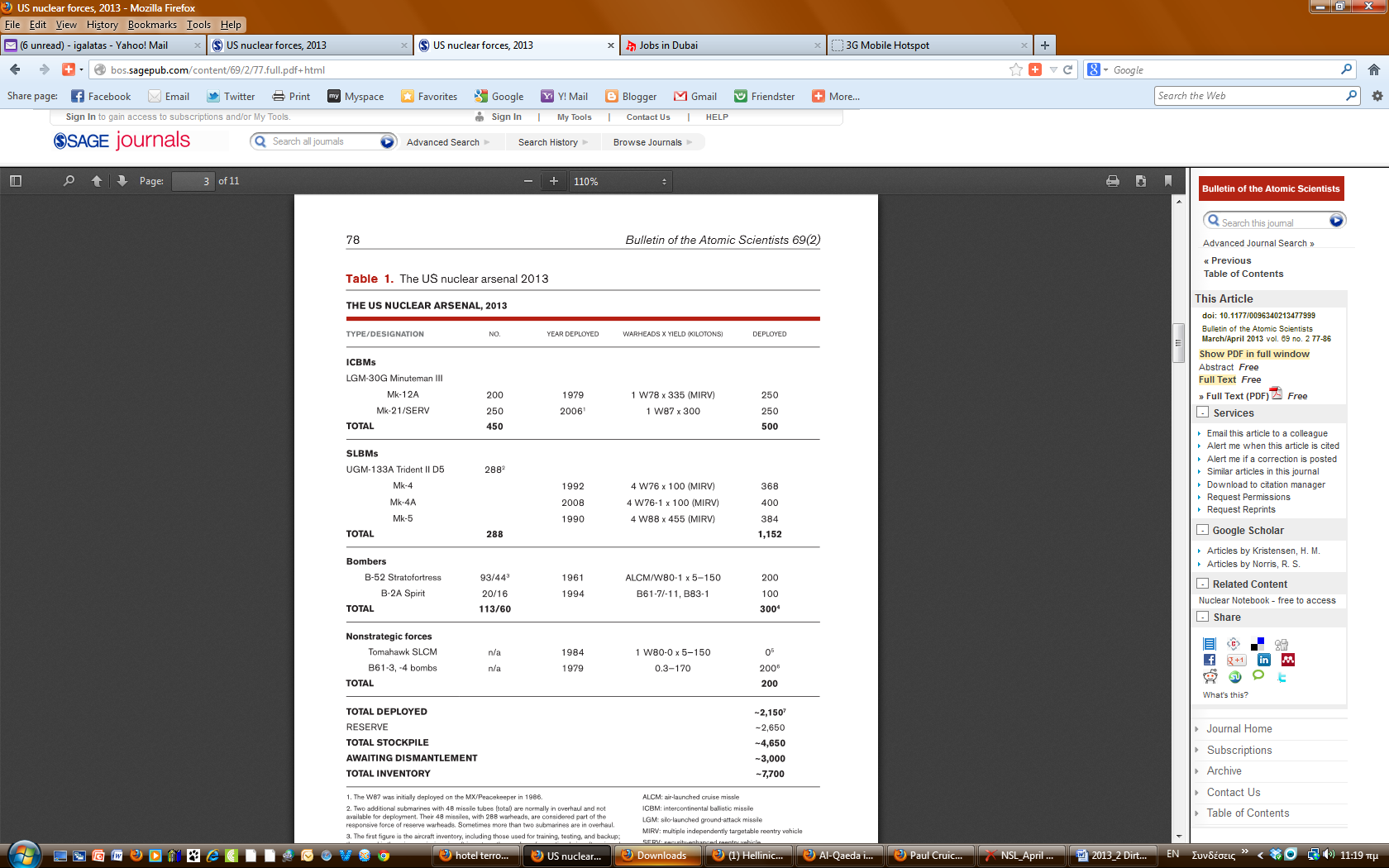
Source: http://bos.sagepub.com/content/69/2/77.full

## Abstract

*As of early 2013, the United States has continued to reduce its nuclear stockpile, and retirement alone has accounted for a dip of over 250 warheads since last year. Of the total stockpile of approximately 4,650 warheads, an estimated 2,150 warheads are deployed. The arsenal is composed of roughly 1,950 strategic warheads deployed with approximately 800 missiles and bombers, as well as nearly 200 nonstrategic warheads deployed in Europe. In this article, the authors scrutinize the US nuclear arsenal.*

*The US Defense Department maintains a stockpile of an estimated 4,650 nuclear warheads for delivery by more than 800 ballistic missiles and aircraft. Compared with last year, that is a reduction of approximately 260 warheads due to the retirement of W80-0 warheads for the Tomahawk land-attack cruise missile, and a reduction of roughly 560 warheads compared with September 2009, when the United States announced that the Defense Department’s stockpile contained 5,113 warheads.*

*The current stockpile includes an estimated 2,150 operational warheads, of which approximately1,650 strategic warheads are deployed on ballistic missiles (1,150 on sea-launched ballistic missiles [SLBMs] and 500 on intercontinental ballistic missiles [ICBMs]), roughly 300 strategic warheads are located at bomber bases in the United States, and nearly 200 nonstrategic warheads are deployed in Europe (see Table 1). The remaining 2,500 warheads are in storage as a so-called hedge against technical or geopolitical surprises.*

Table 1. The US nuclear arsenal 2013

In addition to the warheads in the US stockpile, approximately 3,000 retired, but still intact, warheads are in storage and await dismantlement, for a total inventory of roughly 7,700 warheads.

## Implementing New START

As of September 1, 2012, the United States was counted under the New Strategic Arms Reduction Treaty (New START) as having 1,722 strategic warheads attributed to 806 deployed missiles and bombers—a modest reduction of 15 warheads and 6 launchers compared with the previous count in March 2012. Since the treaty entered into force in February 2011, the United States has reduced a total of 78 strategic warheads and 76 launchers (Kristensen, 2012b).

Due to the counting rules established between Russia and the United States, however, these numbers do not reflect the actual deployment of strategic warheads and launchers, mainly because a large number of bombers that are not assigned nuclear weapons are still counted as nuclear launchers. Moreover, each bomber is counted as carrying only one weapon, even though each of the B-52 bombers can carry up to 20 cruise missiles. At this point in the treaty implementation, the reductions reflect the elimination of so-called “phantom” launchers—aircraft that are no longer assigned a nuclear mission but still are counted due to left-over equipment, like mechanical and electronic interfaces—as well as the fluctuating number of launchers in overhaul at any given time.

In December 2012, the US State Department (2012) released its full aggregate data in a detailed status report. The data show that the United States is implementing the treaty by eliminating phantom weapons first, but that reduction of actual nuclear launchers will not occur until later this decade. Starting in 2015, for example, the Navy will begin reducing missile tubes on each nuclear-powered ballistic submarine (SSBN) from 24 to 20, and later in the decade the Air Force will probably reduce the ICBM force from 450 to 400 missiles.

## Nuclear policy guidance

The Obama administration’s long-awaited nuclear weapons targeting review (sometimes referred to as the post-NPR review or Nuclear Posture Review Implementation Study) was delayed by the 2012 presidential election. The review is intended to identify “options for further reductions in our current nuclear stockpile,” including “changes in targeting requirements and alert postures that are required for effective deterrence” (Donilon, 2011: 5). Once the president selects from a range of options, a Presidential Decision Directive (PDD) will be issued to form the basis of a Nuclear Weapons Employment Policy (NUWEP), prepared by the defense secretary, and a nuclear supplement to the Joint Strategic Capabilities Plan (JSCP-N), prepared by the chairman of the Joint Chiefs of Staff. These documents will then guide Strategic Command’s revision of the strategic nuclear war plan, now known as Strategic Deterrence and Global Strike (or OPLAN 8010) (Kristensen and Norris, 2011). The changes could take several years to implement.

Hints about the conclusions come from the January 2012 defense strategy that concluded: “It is possible that our deterrence goals can be achieved with a smaller nuclear force, which would reduce the number of nuclear weapons in our inventory as well as their role in US national security strategy” (Defense Department, 2012a: 5, emphasis in the original). Moreover, the Defense Department’s May 2012 review of Russian nuclear forces concluded that a Russian disarming first strike against the United States “will most likely not occur,” but even if Russia cheated and broke out of New START and attacked the United States, it “would have little to no effect on the US assured second-strike capabilities that underwrite our strategic deterrence posture” (Defense Department, 2012b, emphasis added by authors). In fact, the Defense report concludes that Russia “would not be able to achieve a militarily significant advantage by any plausible expansion of its strategic nuclear forces, even in a cheating or breakout scenario under the New START Treaty, primarily because of the inherent survivability of the planned US strategic force structure, particularly the Ohio-class ballistic missile submarines, a number of which are at sea at any given time” (Defense Department, 2012b: 7, emphasis added by authors; Kristensen, 2012a).

As a result, the post-NPR review reportedly has concluded that the United States can meet its national security obligations with 1,000–1,100 deployed strategic warheads, or 450–550 warheads less than allowed by New START (Smith, 2013). The conclusion about a reduced force level is expected to form the basis for a new arms control proposal to Russia by the Obama administration this year.

## Land-based ballistic missiles

The US Air Force operates a force of 450 silo-based Minuteman III ICBMs split evenly across three wings: the 90th Missile Wing at F. E. Warren Air Force Base (AFB) in Wyoming; the 91st Missile Wing at Minot AFB in North Dakota; and the 341st Wing at Malmstrom AFB in Montana. Each wing has three squadrons, each with 50 missiles controlled by five launch control centers. New START data show that 449 ICBMs were operational on September 1, 2012, and another 263 ICBMs were in storage (Kristensen, 2012b).

Each missile carries either the 335-kiloton W78 warhead or the 300-kiloton W87 warhead. The last 25 or so Minuteman IIIs equipped with multiple independently targetable re-entry vehicles (MIRVs) are in the process of being downloaded to single warhead configuration, which will leave all ICBMs each armed with a single warhead, as decided by the 2010 Nuclear Posture Review (Defense Department, 2010). Despite the download, the ICBM force will retain a re-MIRV capability to increase the warhead loading if conditions called for such an option.

The US plans to reduce the ICBM force to no more than 420 missiles under New START to meet the limit of no more than 700 deployed nuclear missiles and heavy bombers by 2018. We expect the force will be reduced to 400 ICBMs by inactivating one of three missile squadrons at one of the three bases.

The Air Force is carrying out a multibillion dollar, decade-long modernization program to extend to 2030 the service life of the Minuteman III. The final Propulsion System Rocket Engine (PSRE) placement of the fourth stage was completed at Minot AFB in September 2012. The PSRE program began in 2005 and cost $210 million, a fraction of the total $7-plus billion ICBM modernization program. Although the United States is officially not deploying a new ICBM, the upgraded Minuteman IIIs “are basically new missiles except for the shell” (Pampe, 2012). The total modernization program will be completed in 2015 and will extend the life of the ICBM force through 2030.

The Air Force budget request for 2013 includes $9.4 million to study a replacement for the Minuteman III missiles, and the Air Force Requirements Oversight Council on May 17, 2012, signed off on an “initial capabilities document” for a next-generation ICBM (Grossman, 2012). One potential option is a mobile ICBM that would increase survivability and reduce the requirement to keep missiles on high alert.

Two ICBM flight tests were conducted in 2012 from Vandenberg AFB in California, the same number as in 2011. The first flight occurred on February 25, when a missile randomly picked from a silo operated by the 90th Missile Wing at Warren AFB delivered a single W87 JTA (an unarmed mock-up of the W87/Mk21 re-entry vehicle) to an impact point near the Kwajalein Atoll in the Marshall Islands approximately 7,800 kilometers (4,846 miles) down range in the Pacific Ocean. The second flight test took place on November 14, 2012, and involved an ICBM from the 341st Missile Wing at Malmstrom AFB. The missile carried one unarmed re-entry vehicle.

In addition to the flight tests, two simulated launches—known as Simulated Electronic Launch Minuteman (SELM)—were carried out in 2012. The first took place in early May at Minot AFB and involved the 741st Missile Squadron. The second SELM took place at Warren AFB in late September and involved the 321st Missile Squadron. A SELM “is the most complete test of the operational capability of our ICBMs,” according to Air Force personnel, and “tests the people and equipment from the initial ‘on alert’ transmission all the way to simulated first-stage ignition” (Balken, 2012; Tryon, 2012).

## Nuclear-powered ballistic missile submarines

All of the US Navy’s 14 Ohio-class SSBNs (eight based in the Pacific and six in the Atlantic) carry Trident II D5 SLBMs. Normally 12 of the SSBNs are considered operational, with the 13th and 14th boats in overhaul at any given time, but New START data show that normally fewer than 12 SSBNs are fully equipped with missiles. As of September 1, 2012, for example, only 239 missiles were counted as deployed, 49 less than the capacity of 12 boats, so three SSBNs were not deployed at the time of the count.

The warhead loading of the deployed SLBMs is not specified in the unclassified New START aggregate data, but it is nonetheless possible to estimate. Of the 1,722 total deployed warheads attributed to SLBMs, ICBMs, and bombers, 449 ICBMs each carry 500 warheads, and 118 bombers each count as 118 bombs, so the 239 deployed SLBMs must carry 1,104 warheads—or an average of 4.6 warheads per missile. In practice each missile probably has three, four, or five warheads, depending upon the requirement of the war plan. Loading with fewer warheads increases a missile’s range.

Three versions of two basic warhead types are deployed on the SLBMs: the 100-kiloton W76-0, the 100-kiloton W76-1, and the 455-kiloton W88. The W76-1 is a refurbished version of the W76-0, with the same yield but with an added safety device, a dual strong link detonation control. Moreover, a new arming, fuzing, and firing unit was installed on the re-entry body with improved targeting capabilities. Full-scale production of an estimated 1,200 W76-1 s is under way at the Pantex plant in Texas. So far, roughly 400 W76-1 s have replaced the W76-0 s on Trident II SLBMs and production is scheduled to continue through 2018 or 2021. W76-1 s are also being supplied to Britain’s SSBNs (Kristensen, 2011a).

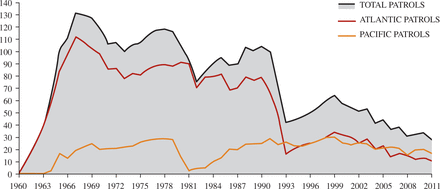
US SSBN operations are being modified. During 2011, the Atlantic and Pacific SSBN fleets conducted a total of 28 deterrent patrols, a reduction from 33 in 2010 (see Figure 1). The reduction continues a downward trend that started in 2000, after 64 patrols in 1999, a significant change that means that each SSBN now conducts an average of 2.5 patrols per year compared with 3.5 patrols a decade ago. The average duration of a patrol is 70 days, with a few lasting over 100 days. More than 60 percent of the patrols take place in the Pacific Ocean, reflecting nuclear war planning against China, North Korea, and eastern Russia.

Figure 1. US ballistic missile submarine patrols 1960–2011

The annual number of US SSBN deterrent patrols has fluctuated as the number of SSBNs has changed over the years. Since 2000, however, the number of patrols has declined by approximately 50 percent.

Credit: Hans Kristensen and Robert Norris.

At any given time, eight or nine of the 12 operational SSBNs are at sea. Four or five of the at-sea boats are on “hard alert,” which means they are in designated patrol areas within range of the targets specified in their assigned target package in accordance with the strategic war plan. The other three or four SSBNs at sea are in transit to or from their patrol areas, and the remaining boats are in port, including two in dry dock with their missiles removed.

Starting in 2015, the number of missile tubes on each Ohio-class SSBN will be reduced by four, from 24 to 20. The reduction is intended to reduce the number of deployed SLBMs, to no more than 240 SLBMs at any given time, to meet the 2018 limit on deployed strategic launchers set by New START.

The Navy has ambitious modernization plans to replace the Ohio-class SSBNs with a new design. The Navy has chosen a submarine that is 2,000 tons larger than the Ohio-class submarine, but with 16 missile tubes instead of the current 24—four fewer than the 20 planned under New START (Brougham, 2012). Twelve replacement SSBNs (tentatively known as SSBNX) are planned, a reduction of two boats compared with the current fleet of 14, at an estimated cost of $90.4 billion. Procurement of the first boat is scheduled for 2021, with deployment on deterrent patrol starting in 2031 (O’Rourke, 2012).

At least during the first decade of its service life, the SSBNX will be armed with a life-extended version of the current Trident II D5 (D5LE) SLBM. The D5LE, which has a new guidance system designed to “provide flexibility to support new missions” (Draper Laboratory, 2006: 8) and make the missile “more accurate,” (Naval Surface Warfare Center Crane Division, 2008: 14) will also be backfitted onto existing Ohio-class SSBNs for the remainder of their service life, starting in 2017. The D5LE will also be deployed on Britain’s SSBNs.

## Strategic bombers

The Air Force currently operates a fleet of 20 B-2 and 93 B-52H bombers at three bases. Of those, 18 B-2 s and 76 B-52Hs are nuclear-capable. An estimated 60 bombers (16 B-2 s and 44 B-52Hs) are assigned nuclear weapons under the strategic nuclear war plan.

Each dedicated B-2 can carry up to 16 nuclear bombs (B61-7, B61-11, and B83-1). The dedicated B-52Hs are assigned air-launched cruise missiles (ALCMs). Although the B-52Hs can also carry gravity bombs, those are currently planned for delivery solely by the B-2. From the 2020s, the B-2 is scheduled to receive the planned B61-12 precision-guided nuclear bomb—a program currently estimated to cost in excess of $10 billion. It is estimated that approximately 1,000 nuclear weapons, including 528 ALCMs, are assigned to the bombers. Most of these weapons are in central storage at Kirtland AFB in New Mexico and Nellis AFB in Nevada, but a small number (we estimate 200 to 300) are stored at Minot AFB and Whiteman AFB in Missouri (nuclear weapons are no longer stored at Barksdale AFB in Louisiana) (Air Force Magazine, 2011; Ferrell, 2012). Although not deployed on the bombers under normal circumstance, the stored weapons could be loaded onto the aircraft in a few days.

The Air Force is designing a new bomber intended to begin replacing existing bombers from the mid-2020s. Procurement of 80–100 aircraft is envisioned, some of which are planned to be nuclear-capable, at a cost of perhaps $55 billion. The new bomber might be equipped to deliver the planned B61-12 precision-guided bomb and B83-1 gravity bomb (if it is retained in the stockpile). The Air Force also is planning a nuclear ALCM, currently known as the Long-Range Stand-Off (LRSO) missile. The current ALCM is scheduled to remain operational through the 2020s. The administration has promised that it will not produce “new” nuclear warheads, so the LRSO could either use a life-extended version of the ALCM’s W80-1 warhead or a life-extended version of the retired W84 warhead that once armed the Ground-Launched Cruise Missile. The LRSO program could cost as much as $1.2 billion, with more millions of dollars needed to reproduce the warhead.

During the last year, the Air Force continued to realign units and increase the nuclear focus to reinvigorate the bomber force. The 705th Munitions Squadron replaced the 17th Munitions Squadron at Minot AFB as part of a multiyear effort to realign the nuclear command structure more directly to Air Force Global Strike Command. A Defense Nuclear Surety Inspection recertified the base in February 2012, and in June the B-52Hs from the 5th Bomb Wing at Minot and the 2nd Bomb Wing at Barksdale conducted a rapid launch exercise with 17 bombers at Minot AFB. In October, the 5th Bomb Wing carried out rapid-launch exercises as part of Strategic Command’s Global Thunder exercise, a worldwide field training and battle staff exercise designed to practice deterrence and strike operations with emphasis on nuclear command and control.

At Barksdale AFB, the 96th Bomb Squadron conducted an eight-hour training flight in April 2012 to practice “nuclear and conventional missions, rapid global strike capabilities, and the ability to reach hardened targets anytime, anywhere” (Air Force Global Strike Command, 2012).

The following month, Barksdale AFB participated in Strategic Command’s Global Lightning nuclear strike exercise, which in 2012 supported Pacific Command’s Terminal Fury exercise by evaluating how the Air Force Global Strike Command provides the theater Joint Force Air Component Commander with heavy bombers against “extremely difficult target sets” (Richard, 2012). The exercise scenario for Global Lightning involved “several crisis action planning and time-sensitive planning problem sets never before seen in Terminal Fury” (Richard, 2012).

Five months later, in October 2012, the 96th Bomb Squadron from Barksdale AFB forward-deployed to Anderson AFB in Guam as part of the Air Force Global Strike Command’s extended deterrence mission in the Pacific. The four B-52H squadrons that have nuclear missions (the 20th and 69th Bomb Squadrons of the 2nd Bomb Wing at Barksdale AFB, and the 23rd and 69th Bomb Squadrons of the 5th Bomb Wing at Minot AFB) and the two B-2 squadrons (13th and 393rd Bomb Squadrons) of the 509th Bomb Wing at Whiteman AFB all rotate through Guam on extended deployments. The deployments began in 2004, each lasting four months, but in 2012 the duration was extended to six months. The nuclear weapons for the bombers deploying to Guam are stored in the continental United States.

## Nonstrategic nuclear weapons

Although the US military has yet to make a formal announcement, we estimate that the remaining nuclear Tomahawk land-attack cruise missiles (TLAM/Ns) and their W80-0 warheads have now been retired. The Pantex Plant in Texas has already “dismantled a very substantial number of W80-0” (Cook, 2013). This completes a historic multi-decade unilateral elimination of all US nonstrategic nuclear weapons. The decision to retire the TLAM/N was made by the 2010 Nuclear Posture Review despite opposition from some, and without demands that Russia also retire such weapons.

As a result of the TLAM/N retirement, we estimate that the US inventory of nonstrategic nuclear weapons now includes approximately 500 warheads, all B61 gravity bombs. Nearly 200 of the bombs are deployed in Europe at six bases in five NATO countries: Belgium, Germany, Italy, the Netherlands, and Turkey. The Belgian, Dutch, and Turkish air forces (with F-16 s) and German and Italian air forces (with PA-200 Tornado aircraft) are assigned nuclear strike missions with the US nuclear weapons (Norris and Kristensen, 2011). The weapons in Europe no longer serve a military purpose and are not tasked with providing the ultimate security guarantee to NATO, a mission that is assigned to strategic weapons.

Although the May 2012 NATO Summit in Chicago approved the Deterrence and Defense Posture Review conclusion that the existing “nuclear force posture currently meets the criteria for an effective deterrence and defense posture” (North Atlantic Treaty Organization, 2012: paragraph 8), NATO has approved a modernization of the nuclear posture in Europe through the deployment of the new guided B61-12 bomb with increased accuracy, and the deployment of the stealthy F-35A Lightning II Joint Strike Fighter in Europe. The B61-12 will also be deliverable by F-15Es, F-16 s, PA-200 Tornado tactical fighter-bombers, and the strategic B-2 stealth bomber (Kristensen, 2011b; Kristensen, 2012c).

## ►References (available at source)

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Back to the basics: how radiation affects our health

Source: http://www.fas.org/blogs/sciencewonk/2013/02/back-to-the-basics-how-radiation-affects-our-health/

Radiation is ubiquitous; an inescapable part of life on Earth.  Background radiation reaches us from outer space, from the rocks and soils we walk on, and from naturally radioactive potassium in our own bodies.  Through its entire history, organisms on Earth have been bombarded by radiation, and this will continue for as long as the Earth exists.  Today, the average person in the US is exposed to about 300 mrem each year from natural background radiation – about 1 mrem a day – and this level of radiation exposure seems to have no ill effects.  Of the estimated 600 or so mutations that occur in each of our cells each year (about 900 in those cells exposed to UV radiation), only about 5 are due to the effects of background radiation.  In short, environmental radiation is a mutagen, but it is not a major source of DNA damage.

At higher levels, however, radiation can cause damage.  Continual exposure to low levels of radiation may cause a mutation that can initiate cancer.  Brief exposure to high levels of radiation can cause skin burns, radiation sickness, or a number of radiation-induced syndromes.

Radiation-damaged chromosomes

**Radiation Damage to Cells**

Radiation can damage cells by directly striking the DNA and causing damage such as single- or double-strand breaks or point mutations.  It’s more likely, however, that the radiation will interact with molecules in the cell’s cytoplasm, splitting them apart and forming reactive molecules called free radicals.  These free radicals, then, go on to cause DNA damage.  Free radicals are caused by more than just radiation – our mitochondria leak free radicals all the time, metabolizing our food can create free radicals, and even dissolved oxygen in our cells can cause DNA damage.  All of this damage is indistinguishable, with the exception of double-strand DNA breaks – we can’t “look” at a point mutation and tell if it was caused by radiation or mitochondrial free radicals.

When radiation passes through a cell the effects can range from non-existent to profound.  There’s a chance, for example, that a gamma ray will pass right through a cell without interacting at all or that the free radicals produced will simply recombine or be scavenged before they can reach the DNA.  If radiation (or the free radicals it produces) do interact with the DNA, there are only a few possibilities – either the DNA will be damaged or it won’t.

If the DNA is damaged, we have a few further possibilities – the damage may be beneficial (e.g., evolutionary advantage), harmful, or neutral (neutral damage is damage that has no effect on the cell – it may be in non-coding part of the DNA, or to a gene that’s not expressed in that particular cell, for example). If the damage kills the cell there’s no problem – in reality, the only way to cause problems is to have DNA damage that’s not fatal to the cell and that affects one of the handful of genes that can cause a cell to become cancerous.

|  |  |
| --- | --- |
| **Acute whole body dose (rads)** | **Effect** |
| 1-10 | Chromosomal changes (fragments, dicentric chromosomes, etc.) |
| 25-50 | Blood cell changes (depressed red and white cell counts) |
| 100 | Radiation sickness in about 10% of those exposed |
| ~400 | Lethal dose to 50% of the population without medical treatment |
| ~800 | Lethal dose to 50% of the population with medical treatment |
| 1000 | Lethal dose to 100% of the exposed population |

However, the possibilities do not stop here, because our cells have DNA damage repair mechanisms – think of them as being like a spell checker; as long as they repair the damage properly then it’s as though it never occurred.  Although these mechanisms are very effective, they are not perfect.  This means that any bit of DNA damage may be repaired properly, may be repaired improperly, or might not be repaired at all.  It is at this point that DNA damage may become a mutation – a mutation is what happens when damage to our DNA becomes “fixed” and is able to be passed on to the next generation of cells.  As with DNA damage, mutations may be good, bad, or indifferent (neutral), and the detrimental mutations may be lethal or sublethal.  And, as before, it is only the sublethal damage that’s of interest to us, and then, only if it can cause the cell to become cancerous.

I’ve taken several paragraphs to describe the different possibilities of radiation interacting in a cell.  Part of this is for the sake of completeness, but it’s also to help drive home an important point – radiation is a weak carcinogen.  If we sum up all the possibilities above, I count over 20 different possibilities.  Of these, only 1 (sublethal damage that is misrepaired or unrepaired and causes a cell to become carcinogenic) have a chance of causing cancer.  Radiation is a carcinogen, but it’s not a very good one – not compared to many of the chemicals we work with.

In the next few sections, I will talk a little more about the effects of both acute and chronic radiation exposure on the organism, instead of the individual cells.

**Acute exposure**

If we are exposed to high levels of radiation in a short period of time, we will suffer from the effects of acute radiation exposure because the damage accumulates faster than it can be repaired.  If the dose is to a limited part of our bodies, we may end up with skin burns, sometimes severe.  There have been many instances requiring amputation of fingers, or even entire limbs.  High levels of radiation exposure to the whole body can lead to radiation sickness or death.

The effects of high radiation dose to limited parts of the body may range from no observable effects (if the dose is low enough) to blistering, burns, or necrosis depending on the dose received.  The effects of whole-body acute radiation exposure can be a bit more complex, and they are summarized in the following table.

**Chronic exposure**

The primary concerns with chronic exposure to relatively low levels of radiation are that we will develop cancer.  There are two competing hypotheses on this matter, and the matter is still far from being settled.

***LNT***

The linear, no-threshold (LNT) hypothesis suggests that all radiation exposure is potentially harmful (the “no-threshold” part), and that the risk of getting cancer from radiation is directly proportional to the dose received (the “linear” part).  LNT is the most conservative radiation dose-response model in that it predicts the highest risk from a given amount of radiation exposure.  This is one of the reasons that the LNT is the foundation of radiation regulations virtually everywhere in the world – since we really aren’t sure how we respond to low levels of radiation exposure, it makes sense to control dose (and risk) according to the most conservative model.

One problem with the LNT is that it can be used to predict cancer risks down to vanishingly small levels of exposure, and so it has been used to calculate expected cancer rates from exposure to radon, “dirty bombs,” and medical x-rays.  For example, say that the risk of getting cancer from a given radiation exposure is 5 additional cancer deaths for every 10,000 person-rem.  That means that exposing 10,000 people to 1 rem each should result in an extra 5 cancer deaths among those people.  Or, exposing 1 million people to 10 mrem each should also lead to 5 added cancer deaths.  It’s easy to see that we can use this model to predict added cancer deaths from any level of radiation exposure, no matter how trivial, if enough people are exposed.  By analogy, we can also say that, since a 1000 kg rock will crush someone, throwing a million one-gram rocks at a million different people will crush someone.

This doesn’t make much sense, and both the Health Physics Society and the International Commission for Radiation Protection have advised against this misuse of the LNT model.  In fact, we just don’t know what happens at such low levels of exposure, and we can’t make any such predictions for very small levels of exposure.  According to the Health Physics Society, in two separate position papers (which can be found on the HPS web page at www.hps.org), we simply can’t calculate a numerical risk estimate from any exposure of less than 10 rem, so even the first calculation runs afoul of HPS recommendations.  In a similar vein, the ICRP has suggested that, when looking at the risk from collective dose, if the most highly exposed individual receives a trivial dose, then everyone’s dose should be treated as trivial.

***Threshold/Hormesis models***

Virtually all harmful substances exhibit some level below which there are no apparent harmful effects.  This is part of the idea behind the No Observable Adverse Effects Level (NOAEL) – below a threshold dose you simply don’t see any effects from exposure to a substance.  There are those who feel that radiation probably behaves similarly – that there is a level of exposure below which there are observable effects from radiation exposure.

There are also those who think that exposure to low levels of radiation may be beneficial.  This is called hormesis and, although it sounds implausible at first blush, there are plenty of examples of hormesis in the world.  Two examples are vitamin D and selenium.  Both of these substances are vital nutrients, and both are acutely toxic in sufficiently high doses.  Low doses of aspirin can help to stave off heart disease (not to mention the beneficial effects on fever, pain, and inflammation), yet high doses of aspirin can be fatal, and people can also die of excessive salt intake or even water intoxication.  In short, the idea of hormesis is not outlandish; only the application of hormesis to radiation exposure seems unusual because we are all so steeped in the idea that radiation is uniformly bad.

The idea behind assuming a threshold in our response to radiation exposure is that, given the variations in Earth’s background radiation field, it makes sense that our cells should be able to adequately repair DNA damage from slightly elevated levels of radiation.  And, let’s face it; radiation is not one of the major environmental mutagens (it accounts for about 1%-5% of background DNA damage).  Our biochemistry contains very effective mechanisms for repairing DNA damage, and it is thought that these mechanisms are able to accommodate some level of added damage, such as would result from exposure to low levels of radiation.

The thinking behind positing hormesis effects is that, by presenting a continuing challenge to our mutation repair and tumor suppression mechanisms, they are kept at peak operating efficiency.  They are better able to contend with the ordinary, garden-variety damage that is always cropping up in our genome and, as such, our DNA is better protected than if this radiation exposure was removed.

The best way to test these hypotheses, of course, is to perform epidemiological studies of exposed populations, and many such studies have been performed with equivocal results.  Researchers have looked at radiation workers, residents of natural high-background areas, radon concentrations versus lung cancer rates, radiologists, and atomic bomb survivors, among others.  Some studies show that risks are slightly higher, some show no effects at all, and some show fewer cancers than expected in the study populations.  Part of the problem is that the effects are often smaller than the error bars, and this makes it very difficult to pick out what is actually happening.  Unfortunately, there is not yet a “gold-plated” study that everyone can point to and agree that it was properly done, controlled for all confounding factors, and shows a significant result.

Given this degree of uncertainty, many health physicists and most governments feel it is best to control radiation exposure under the risks of the highest-risk model, LNT.  The thinking is that, if we maintain risks at a low and acceptable level under LNT, then whichever model is correct, we will be at no more risk than we have agreed we can accept.  The only problem with this model is that, if one of the other models better represents reality, we will have spent a lot of time, effort, and money controlling illusory risks and these resources will have been taken away from more effective risk-reduction measures.  So this question needs to be answered, and we will hopefully be able to do so before too much longer.

**Japan says 30-40 years to scrap Fukushima plant**

# Source: http://www.reuters.com/article/2011/12/21/us-japan-nuclear-idUSTRE7BK0FD20111221

Decommissioning Fukushima Daiichi nuclear power plant will take three or four decades, Japan's government said on Wednesday as it unveiled plans for the next phase of a huge and costly cleanup of the tsunami-wrecked complex.

The plant, 240 km (150 miles) northeast of Tokyo, was destroyed on March 11 by a huge earthquake and a towering tsunami which knocked out its cooling systems, triggering meltdowns, radiation leaks and mass evacuations.

After months of efforts the government said last week that the reactors, in operation since the 1970s, were in a state of cold shutdown, signaling it was ready to move to a longer-term phase to eventually decommission the plant.

In the next cleanup "road map" revealed on Wednesday, removal of spent fuel from the facility will begin within the next two years, the government said, with removal of melted fuel debris from the damaged reactors starting within 10 years.

It said all kinds of technologies must still be developed before the plant can be scrapped in 30 to 40 years.

"The period of time it would take to decommission the plant should not have a direct bearing on when the evacuees will be allowed to return home," Trade Minister Yukio Edano, who oversees energy policy, told reporters.

About 80,000 people were evacuated from within a 20 km (12 mile) radius of the plant soon after the March disaster but some of them may be allowed to return as early as next spring now the cold shutdown has been declared.

Edano said the total cost of the cleanup was unclear.

"It's hard to estimate the cost of the plant cleanup at this stage," he said.

"We may at some point draw a clearer cost estimate but it would be difficult to make estimates of something four decades down the line in just one or two years from now."

**Vast cleanup costs**

An official advisory panel has estimated **it may cost about 1.15 trillion yen ($15 billion) to decommission the plant, though some experts put it at 4 trillion yen or even more.**

"The cost of the cleanup will be vast, and Tepco should naturally shoulder the cost," Edano said, referring to plant operator Tokyo Electric Power Co.

The huge compensation payments and cleanup costs saddling Tepco could endanger its position as an independent firm as the stricken utility may need huge injections of public cash.

The government plans to take a stake of more than two-thirds in Tepco in a de facto nationalization of the utility, the Yomiuri newspaper said on Wednesday.

The utility said it could be another eight years or so until it can check what it is like inside the crippled reactors.

"The most technically challenging issue is removing the fuel debris from the reactor core ... To do so, we will need to develop quite a bit of technology in all fields," Tepco official Kazuhiro Takei told a news conference.

No one knows the exact state of the nuclear fuel in each reactor. Experts say the fuel rods have melted and dropped to the bottom of the vessels.

The cleanup road map unveiled on Wednesday is for the Daiichi plant alone, with a massive cleanup also needed outside the complex if residents are to be allowed to go home.

**The Environment Ministry says about 2,400 square km (930 square miles) of land around the plant may need to be decontaminated, an area roughly the size of Luxembourg.**

Doubts also linger about whether the cold shutdown announcement was too hasty and media voiced doubts over whether the reactors and their contamination have really been contained.

# Chaos from the Sky: Why the EMP Threat Is Real

By Jordan Harms

Source: http://blog.heritage.org/2013/03/12/chaos-from-the-sky-why-the-emp-threat-is-real/

Two scholars from the congressionally mandated 2010 Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack make the case to protect the U.S. from a potentially catastrophic nuclear EMP attack on the U.S. by terrorists or rogue states.

William Radasky and Peter Vincent Pry rebut Yousaf M. Butt’s charge that the EMP threat is “overblown.” They point out that the EMP Commission report was a collaborative effort between “the Intelligence Community…the military services…the National Nuclear Security Administration laboratories…the Department of Defense and the Department of Homeland Security,” all of which concluded that the nation is unprepared for an EMP attack.

An EMP is a high-intensity burst of electromagnetic energy caused by the rapid acceleration of charged particles. An EMP can change the magnetic field in the earth’s atmosphere to disrupt electronic devices by a pulse flowing through electricity transmission lines, overloading and damaging transmission distribution centers. According to Heritage’s James Carafano, in the event of an EMP, “communications would collapse, transportation would halt, and electrical power would simply be nonexistent.”

Butt charges that terrorists have access only to low-yield weapons and that such a weapon “would be restricted to only a small region of the country.” This premise is wrong on three counts:

1. If terrorists do obtain a nuclear weapon, it will likely not be a one-kiloton weapon but a far more sophisticated one from Russia or a rogue state;
2. The “brain drain” from Russia enabled North Korea to make (and potentially test) “Super-EMP” low-yield nuclear weapons that can generate very powerful EMP fields over wide geographic areas; and
3. Even a low-yield weapon could knock out the entire Eastern seaboard if detonated from a higher altitude than the 40-kilometer level needed for peak EMP field results.

In addition, terrorists would not even need a long-range missile to deliver an EMP attack; they could instead launch a short- or medium-range missile from a freighter outside U.S. territorial waters. The attack would leave no “fingerprints,” since medium-range missile “signatures” are virtually identical and EMP trajectories are so short.

An EMP attack would cause cascading failures in other critical infrastructures and a possible national blackout. These conclusions are based on tests showing that E1 high-EMP simulators couple well to electric grid distribution power lines and low-voltage cables. Radasky and Pry point out that “electronic control systems are effectively the Achilles’ heel of our power delivery network.”

The electrical power grid supports all of America’s other critical infrastructures and is vulnerable to an EMP. Any credible threat depends on critical communications infrastructures. If an EMP attack should succeed, more than two-thirds of the American people could perish within 12 months of the event.

China, North Korea, and Russia have targeted EMPs as the primary means of attack to be used as a credible deterrent threat against the U.S. The U.S. should develop a comprehensive ballistic missile defense system to address this threat. In addition, the country needs to harden its infrastructure and make it more resilient to withstand potential attacks.

**Jordan Harms** is currently a member of the Young Leaders Program at The Heritage Foundation.

# Rebuttal to “The EMP threat: fact, fiction, and response”

### By Dr. William Radasky and Dr. Peter Vincent Pry

### Source: http://www.thespacereview.com/article/1656/1

Yousaf M. Butt in “The EMP Threat: Fact, Fiction, and Response” (The Space Review, Part 1, January 25, 2010 and Part 2, February 1, 2010) casts aspersions on the competence and honesty of the congressionally mandated Commission To Assess The Threat To The United States From Electromagnetic Pulse (EMP) Attack. Dr. Butt alleges that the EMP Commission’s finding that terrorists or rogue states could make a potentially catastrophic nuclear EMP attack on the United States is “overblown.”

We are concerned that the article will misinform the public and scientific community on a vitally important issue of national security policy, and so seek to correct the record with this rebuttal. The rebuttal offered here is ours and is not an official response from the EMP Commission. (It is noted that the terminology in this discussion paper will use EMP (a general term) and (high-altitude electromagnetic pulse) HEMP interchangeably. It is noted that the terms E1 HEMP and E3 HEMP are only defined in this manner.)

Dr. Butt asserts that, “The methodology and conclusions of the EMP commission have already been criticized a few years ago.” To substantiate his claim, Dr. Butt references articles such as “The Newt Bomb” in *The New Republic*—none are serious scientific studies but merely political cartoons, authored by persons who have no competence to judge the EMP Commission’s work, and who obviously never even read the EMP Commission reports. For example, these articles condemn the EMP Commission for advocating National Missile Defense and preemptive war against Iran. Yet the EMP Commission never made any such recommendations.

### EMP Commission background

Dr. Butt neglects to tell his readers anything about the purpose and qualifications of the EMP Commission, not even offering a footnote on the EMP Commission reports so that readers can investigate the reports for themselves, presumably because this would not advance Dr. Butt’s agenda. Congressional commissions, like the EMP Commission, are instruments of last resort, established when departments and agencies and the Congress can achieve no consensus on a controversial issue vital to the national interest. Typically, commissioners are senior statesman and nationally recognized scientists or experts, selected on a bipartisan basis, so that their findings will be respected by all. Congressional commissions typically are invested with broad legal powers to carry out investigations, compel departments and agencies to provide any and all relevant information, hold hearings to air all points of view, and to conduct research. Congressional commissions endeavor to arrive at a consensus that can serve as the best-informed basis for public policy.

The EMP Commission had all of the above powers and characteristics, not least in that the EMP Commissioners and staff included our nation’s foremost experts on EMP, nuclear weapons, and critical infrastructures. For example, the EMP Commission Chairman, Dr. William Graham, began his career working on EMP at the Air Force Weapons Laboratory (AFWL), then Rand Corporation and later R&D Associates, and later served as President Reagan’s Science Advisor. EMP Commissioner Dr. John Foster is our nation’s foremost nuclear weapons expert, having worked on the design of most of the nuclear weapons in the current US inventory. Other EMP Commissioners and staff have equally impressive backgrounds as nationally recognized experts on the national power grid, telecommunications and other critical infrastructures, and on testing and modeling to assess their vulnerability. The EMP Commission has excellent bipartisan credentials, having been first established by a Republican-majority Congress, re-established by a Democratic-majority Congress, with all commissioners selected on a bipartisan basis. The EMP Commission conducted groundbreaking experiments, some never before attempted, using EMP simulators to test a wide variety of electronic systems, vital to operation of critical infrastructures, in order to assess their vulnerability to EMP. Eight years of the most comprehensive and meticulous investigation and research yet conducted on the vulnerability of modern critical infrastructures went into the EMP Commission’s threat assessment. Collaborating with the EMP Commission’s work and reviewing its reports were the Intelligence Community (CIA, DIA, NSA); the military services (US Strategic Command, Air Force, Army, and Navy); the National Nuclear Security Administration laboratories (Lawrence Livermore, Los Alamos, and Sandia); the Department of Defense and the Department of Homeland Security.

Given this background on the EMP Commission, the vast resources available to it, the scale and duration of its work, and the vast extent of its collaboration and review, does it really seem plausible, as Dr. Butt suggests, that the EMP Commission erred, or lied, about the nuclear EMP threat that could be posed by terrorists and rogue states?

### EMP threat from low-yield nuclear weapons

Dr. Butt’s chief argument against the EMP Commission is his unfounded assertion that EMP from a low-yield (1-kiloton) nuclear weapon—that he assumes would be the yield of a terrorist or rogue state nuclear weapon—is not sufficient to cause catastrophic consequences against US critical infrastructures. Dr. Butt hinges his argument on the well-known fact that, for nuclear weapons of conventional design, a weapon of high yield will produce stronger EMP fields than a weapon of low yield. But this does not prove—and nowhere does Dr. Butt prove or offer compelling evidence—that EMP from a low-yield nuclear weapon would be insufficient to cause a national catastrophe.

It must be noted that Dr. Butt’s assumption that a terrorist or rogue state nuclear weapon could not have a yield greater than 1-kiloton is a view unique to him, and constitutes an unrealistically benign assessment of the likely nuclear threat. Proliferation of a Russian tactical nuclear weapon—of which there are many thousands, being the most numerous nuclear weapons in the world—is still considered one of the most likely pathways by which terrorists or rogue states might acquire a nuclear weapon. Russian tactical nuclear weapons typically have yields of 10-100 kilotons, and can be up to a megaton.

But let us first deal with Dr. Butt’s argument on its own terms, and consider his extraordinarily benign EMP scenario, clearly a “strawman” constructed by Dr. Butt to support his hypothesis, where the threat is from a 1-kiloton weapon.

Tellingly, unable to offer or find test results or calculations that support his dismissal of the EMP threat from low yield weapons, Dr. Butt complains that the EMP Commission unclassified report does not divulge test data for the EMP effects of nuclear weapons of varying yield. Dr. Butt:

Although the EMP commission carried out tests of the robustness of various devices to E1, the unclassified version of the commission documents do not contain many meaningful technical details. We simply do not know the level of EMP stress applied in the quoted tests, and whether they would be appropriate to a large (greater than 100 kilotons) or a small (1 kiloton) type device.

Of course, the EMP Commission was not at liberty to disclose—and was careful not to disclose—classified data that could help terrorists or rogue states attack the American people. The EMP Commission deserves credit for sharing with the American people more unclassified information on the EMP threat to critical civilian infrastructures than ever before provided, an achievement that required the EMP Commission report to undergo several years of security review.

What of Dr. Butt’s questioning the EMP threat from a 1-kiloton nuclear weapon? Since the EMP Commission warns that any nuclear weapon, including a low yield nuclear weapon, could be used to make a catastrophic EMP attack on the United States, the reader can be confident that the EMP Commission’s test data supports that judgment.

The EMP Commission sponsored tests on commercial equipment and evaluated the failure levels of equipment separately from the computation of the E1 and E3 HEMP fields for different weapons and scenarios. The EMP Commission could not openly publish the results of detailed HEMP calculations for specific weapon designs, but it was clear that there would be significant effects from all types of weapons. As expected, the area coverage of larger yield weapons for E3 HEMP is larger than from lower yield weapons.

However, Dr. Butt is mistaken in suggesting that HEMP effects are somehow linearly scalable with weapon yield, especially for E1 HEMP. Yield is more of a factor for E3 HEMP, but there is a saturation effect for E3 (and E1) HEMP, and the maximum fields on the ground do not scale with total yield. Consequently, the E3 HEMP field from a 10-kiloton weapon is not 100 times smaller than for a 1-megaton weapon. It should be noted that the IEC maximum specification for E3 HEMP is 40 V/km. A field of 1 V/km is enough to create serious effects on a power grid.

Dr. Butt’s statement that “significant E3 would not be expected from a low yield weapon, as would be expected from a solar storm” is misleading. It is true that a “great” geomagnetic storm could produce larger E3-like fields on the ground than a low yield weapon, but such a storm produces “overkill.” The E3-like fields produced during the Hydro-Quebec blackout in 1989 can also be produced by a low yield weapon.

Even Dr. Butt’s own calculations, biased to minimize the threat, indicate that EMP from a 1-kiloton weapon would be significant, a fact Dr. Butt reluctantly acknowledges and tries to obfuscate rhetorically. Dr. Butt:

The bottom line is that, indeed, our infrastructure is vulnerable to significant E1 and E3 pulses… while a small weapon could certainly produce substantial destructive E1 fields, such fields would be restricted to only a small region of the country… Serious long-lasting consequences of a one-kiloton EMP strike would likely be limited to a state-sized region of the country.

Most Americans would regard the loss to EMP of an entire state to be non-trivial. Moreover, everything we know about the response of the electric grid to accidental failures and natural disasters indicates a propensity for small local problems to escalate and spread over much wider areas, and for the resulting widespread blackout to cause cascading failures in other critical infrastructures. This is so because the national electric grid is aged and often operating on the verge of failure—and everything depends upon electricity. It would be “suicidally optimistic,” to borrow a phrase from Dr. Butt, to assume that an EMP attack that inflicted a state-wide blackout would not also cause cascading grid and infrastructure failures at least regionally. Indeed, such an event could well become a protracted national blackout.

Dr. Butt’s calculations are deliberately biased to limit the EMP effects by first selecting a threat yield of 1-kiloton, and then claiming effects “only” in one state. He argues that terrorists or rogue states using a 1-kiloton weapon would want to optimize the EMP field strength by detonating at the lowest possible altitude, trading a gain in increased EMP field strength for a greatly reduced area of effect, limited to a radius on the ground of 725 kilometers. Dr. Butt:

…the “sweet spot” for maximizing the EMP lethality of such weapons would be a detonation altitude of about 40 kilometers--significantly higher, or lower, and the peak fields at ground level will decrease....For 40 kilometers altitude, the maximum extent of the induced EMP E1-fields is within a 725-kilometer radius.

However, contrary to Dr. Butt, terrorists or rogue states may prefer to trade reduced EMP field strength for a gain in area coverage, detonating their low-yield nuclear weapon at a higher altitude, covering the eastern part of the United States with an EMP field. Dr. Butt is mistaken that only the maximum region of the E1 HEMP field is important. That is completely wrong, as the peak electric field is not the only important parameter for coupling to cables and equipment. Extensive research has found that more horizontal angles of incidence of the E1 HEMP are much more efficient in coupling to lines, despite their lower field strengths. The many errors in Dr. Butt’s understanding of HEMP phenomenology appear to result from a lack of familiarity with some of the most basic texts on EMP, such as E.F. Vance’s *Coupling to Shielded Cables* and MIL-STD-188-125, which provides a method of hardening and testing ground-based C4I facilities to HEMP. The MIL-STD-464 cited by Dr. Butt as a source is recognized among specialists as having little value for EMP aspects.

EMP from a 1-kiloton weapon, though “weak” in comparison to a megaton-range EMP, could still have catastrophic consequences for the critical infrastructures that sustain the U.S. economy and society. This is so because the US electrical power grid, which supports all the other critical infrastructures, is extremely fragile and vulnerable to any EMP attack. Modern microelectronics are over one million times more vulnerable to EMP than electronic systems of the 1960s, and could be damaged or destroyed by the EMP from a low-yield nuclear weapon detonated high enough to cover, for example, the eastern United States. Safety relays and SCADAs (System Control And Data Acquisition) control everything, including the current flowing into big transformers that are indispensable to the power grid, and that currently would require years to be repaired or replaced. Dr. Butt himself provides anecdotal evidence illustrating the shocking fragility of the electric power grid, citing the August 2003 Northeast Blackout and the cascading failures that resulted when a high voltage power line was assaulted by a tree branch:

The outage affected the Northeast US and parts of Canada and more than 200 power plants, including several nuclear plants, were shut down as a result of the electricity cutoff. Other effects included loss of water pressure, possible sewage contamination, gridlock, various other transportation problems (because of secondary effects on railways, airlines, and gas stations), and disruption of oil refineries’ operations. Phone service was stressed due to high call volume and several radio and television stations went off the air. It is estimated that the one-day blackout cost $7–10 billion in spoiled food, lost production, overtime wages, and other related expenses inflicted on more than one-seventh of the US population.

All of this from a tree branch. It is not an isolated incident. The EMP Commission found many large-scale blackouts of the power grid that were started by a seemingly trivial local problem. A low-yield nuclear weapon detonated to place an EMP field over the entire eastern portion of the United States would certainly place more stress on the electric grid than a single tree branch, and multiply the above effects manifold by causing many local failures, that could cascade into a national catastrophe.

### Sophistication of rogue state and terrorist nuclear weapons

Dr. Butt is fixated on disproving the EMP threat from a 1-kiloton nuclear weapon because he mistakenly thinks the EMP Commission shares his assumption that this is the likely yield for a rogue state or terrorist nuclear weapon. According to Dr. Butt:

…such missiles [as Iran’s Shahab-3] have a payload capacity of approximately 1,000 kilograms corresponding to a crude U-based warhead of 1 kiloton yield—if, and when, the Iranians eventually develop nuclear weapons. Even the North Koreans, who are much further along in their weapons program, have had great difficulty reaching even a 5 kiloton yield from their Pu-based devices in carefully orchestrated ground tests, and their 2009 test was likely a fizzle.

The historical record and the best evidence does not support Dr. Butt’s view that terrorist or rogue state nuclear weapons are likely to be inferior to the first atomic bombs produced by the United States during World War II. If terrorists get a nuclear weapon, most analysts believe it will come from Russia or one of the rogue states, and so be far more sophisticated than anything the terrorists could build themselves. Dr. Butt’s rosy views about nuclear proliferation notwithstanding, the Defense Department and State Department have given high priority and invested vast resources to prevent the proliferation of nuclear weapons and technology from Russia. The threat of nuclear proliferation from Russia is still very real, as President Obama made clear in his 2010 State of the Union Address.

Nuclear aspirant rogue states, like North Korea, Iran, and Syria, have a huge advantage over the United States’ Manhattan Project of World War II, which invented the first atomic bombs in three years relying on 1930s and 1940s era technology. Rogue states can draw upon huge quantities of unclassified and declassified literature—including the original Manhattan Project papers—for guidance on building their nuclear weapons. Rogue states can and do purchase on the international market all manner of commercial and dual-use technologies relevant to developing nuclear weapons, technologies 70 years more advanced than that available to the U.S. Manhattan Project. Rogue states can and do rely on international criminal organizations, like the A.Q. Khan network, to help them get the technology and know how they need for nuclear weapons. Rogue states help each others’ nuclear weapons programs, as North Korea was recently helping Syria, and is helping Iran. Rogue states can and do buy help from Russia and China.

The record does not support Dr. Butt’s assumption that rogue state nuclear weapons are likely to be primitive. Credible open source reporting, including from Mordecai Vanunu, who worked in Israel’s nuclear weapons program, indicates that Israel has developed an array of sophisticated nuclear weapons, including thermonuclear weapons and miniaturized warheads for its Jericho missile—without nuclear testing. There is no reason North Korea, Iran, and Syria cannot duplicate Israel’s feat, especially as they have even greater resources than Israel. Pakistan and India quickly leapt from a few nuclear tests to deployment of an array of nuclear weapons, including warheads miniaturized for delivery by ballistic missile. Pakistan claims to have tested a thermonuclear weapon. If true, it is less likely a high yield weapon, and more likely a specialized weapon, like a neutron bomb. Sam Cohen, “Father of the Neutron Bomb,” credited Israel and South Africa with developing such weapons. The United Nations nuclear watchdog, the IAEA, discovered that a criminal group proliferated blueprints for a miniaturized nuclear warhead that could be delivered by Iran’s Scud or Shahab-3 missiles.

### Super-EMP weapons

Last but not least, senior Russian EMP experts warned the EMP Commission that “brain drain” from Russia enabled North Korea to make what the Russians call “Super-EMP” weapons. According to Russian open sources, these are small, low-yield nuclear weapons that can generate extraordinarily powerful EMP fields, many times more powerful than the E1 EMP from a multi-megaton weapon. Both of North Korea’s nuclear weapons tests that produced low yield “fizzles” look very like what would be expected from a “Super-EMP” weapon. According to open source reporting, South Korean military intelligence claims North Korea is receiving Russian help developing “Super-EMP” weapons.

Moreover, the EMP Commission discovered from its investigations that, as noted in the Commission’s unclassified Executive Report, “Certain types of relatively low-yield nuclear weapons can be employed to generate potentially catastrophic EMP effects over wide geographic areas, and designs for variants of such weapons may have been illicitly trafficked for a quarter-century.”

On a related matter, Dr. Butt incorrectly asserts that “due to the fact that the super-EMP weapon will be directional, it is unlikely to effect a large part of the country.” In fact, a “Super-EMP” weapon can be designed to be directional (the more challenging design) or to cover broad area (the simpler design). The simplest design of a “Super-EMP” nuclear weapon, configured for broad area coverage, could generate extraordinarily high EMP fields over the entire contiguous United States.

The bottom line is that no one knows how sophisticated or unsophisticated present and future terrorist and rogue state nuclear weapons may be. But it would be folly to gamble the lives of millions of Americans on Dr. Butt’s unwarranted certainty that those weapons are and will remain unsophisticated.

### Russia and China

Dr. Butt reassures us that the United States need not worry about any EMP threat from Russia or China, as these nations will be deterred by economic self-interest. Dr. Butt:

We owe China tremendous sums of money, they need us as a market, and both the US and China require Russian oil via intertwined world markets.

Those who opposed military preparedness before World Wars I and II used this same argument—that German aggression and world war was impossible because of the economic interdependence of European states and the world. Economic interdependence did not stop the world wars from happening. Nor did China’s economic partnership with the United States stop a Chinese general, during the 1996 Taiwan Straits Crisis, from threatening a nuclear strike against Los Angeles.

While the United States no longer views Russia and China as enemies, the reverse is not also true. Russia and China in public statements and military writings continue to portray the US as a potential enemy, often as a reckless aggressor seeking to impose a New World Order dominated by the United States. Russian and Chinese military writings are replete with scenarios and references to making EMP attacks against the United States. Indeed, during the 1999 Balkans Crisis, leaders of the Russian Duma raised the specter of a Russian EMP attack that would paralyze the United States, in order to stop US bombing of Serbia. In 2009, shortly after the election of President Obama, Russian President Medvedev threatened to neutralize NATO’s deploying missile shield by targeting nuclear weapons on radars and interceptors in Poland and the Czech Republic, and by “radioelectronic means”—Russian parlance for EMP.

The EMP Commission Report warns, “China and Russia have considered limited nuclear attack options that, unlike their Cold War plans, employ EMP as the primary or sole means of attack.” America cannot afford to bet its security on the perpetual good will of Russia and China. Deterrence of an EMP attack on the United States by Russia or China only has to fail once for the American people to suffer catastrophic consequences.

### ICBM EMP threat

Dr. Butt asserts: “A state would be highly unlikely to launch an EMP strike from their own territory because the rocket could be traced to the country of origin and would probably result in nuclear or massive conventional retaliation by the US.” Contrary to Dr. Butt, if the EMP attack works, the United States will be in no condition to retaliate. Russian open source military writings claim that “Super-EMP” weapons generate such powerful fields that even hardened U.S. strategic forces would be vulnerable. Massive conventional retaliation by the United States, which could deter such an attack, depends on the survival of US civilian critical infrastructures that are indispensable to power projection.

Moreover, if retaliation is possible, there is the dilemma of what kind of nuclear retaliatory strike the United States would make in response to an EMP attack? The EMP targets electronics, not people, and would not immediately kill millions. Mass casualties would come later, from secondary effects, if the United States continues to be unprepared. A retaliatory EMP strike on a nation like North Korea would be close to meaningless, since they are not as dependent as the U.S. on advanced electronic infrastructures. Inflicting a nuclear holocaust on Tehran or Pyongyang for an EMP attack might not seem like a proportionate response to an American president, at least not immediately.

Further, nations like North Korea and Iran may seek long-range missiles so they can credibly threaten to launch an EMP attack from their territory, rather than actually execute such an attack. The acquisition of such capability will immediately change the calculus of risk for the United States in upholding its alliance relationships, and in US willingness to impose sanctions or undertake military action against the state capable of launching an EMP attack against the American homeland. Rogue states that possess a “force in being” capable of threatening the American homeland with EMP would have a promising means of deterring the United States. During the Cold War, the United States deployed hundreds of missiles and thousands of warheads to establish a Mutual Assured Destruction (MAD) relationship with the Soviet Union, that successfully deterred the USSR from invading NATO or attacking the United States. Today, with one or a few ICBMs capable of inflicting a catastrophic EMP attack on the American people, a rogue state could recreate the MAD relationship with the United States, very much to the detriment of American interests.

Finally, vengeance should not be underestimated as a motive for a rogue state launching an EMP strike from its own territory against the United States. North Korea and Iran and other rogues are probably doomed for the ash heap of history. When they collapse, if they can take their enemies with them, they will almost certainly try to do so. Rogue leaders will want the United States to know that the EMP attack came from them, when the mob is at their gate.

### Nuclear terrorism

One scenario of particular concern to the EMP Commission is that rogue states or terrorists could make an “anonymous EMP attack” by launching a short- or medium-range missile off a freighter outside US territorial waters. This would eliminate the need for an ICBM to deliver the EMP attack. Since the EMP strike would come from no one’s territory, it could also conceal the identity of the attacker. Although it would not be necessary, an additional layer of anonymity could be achieved by a state sponsor by contracting with terrorists to carry out the attack.

Dr. Butt contends “it is highly unlikely that a nation would give one of its crown jewels [a nuclear weapon] to an unpredictable terrorist cell.” Dr. Butt quotes a paper done at the National Defense University that states, “Iran would not, as a matter of state policy, give up control of such weapons to terrorist organizations and risk direct U.S. or Israeli retribution.”

Yet Iran and Syria are killing Americans and Israelis every day, by providing increasingly sophisticated weapons to Hezbollah and Hamas to attack Israel, and to terrorists in Iraq to kill Americans there, apparently without fear of US or Israeli retribution.

Dr. Butt’s view that not even Iran—the world’s leading sponsor of international terrorism—would give a nuclear weapon to terrorists, is an opinion unique to Dr. Butt and the authors of the NDU paper, which does not represent the official view of the National Defense University. The mainstream view, so widely held that it probably deserves to be described as a consensus, is that Iran, North Korea, Russian organized crime, or other actors might transfer a nuclear weapon to terrorists. Iran’s sponsorship of international terrorism is one of the chief reasons successive American presidents have made it a priority of their administrations to stop Iran’s nuclear weapons program. In hearings held before the Senate Homeland Security Committee in 2008, Chairman Joseph Lieberman and the Director of Intelligence for the Department of Homeland Security, Mr. Charlie Allen, both warned that state-sponsored nuclear terrorism is a real prospect. That is why one of the most ambitious programs sponsored by the Department of Homeland Security is to improve U.S. port security and develop new technologies capable of detecting a nuclear weapon being smuggled into a US city.

The consensus view of the Congressional Commission on Weapons of Mass Destruction (reporting in 2008 and 2010), whose findings—like that of all Commissions—are supposed to provide the authoritative basis for making national security policy, warns that state-sponsored nuclear terrorism is a very real threat. The consensus view of the Congressional Commission on the Strategic Posture of the United States (reporting May 2009), independently arrived at the same conclusion as the EMP Commission, and warns that “the United States should take steps to reduce the vulnerability of the nation and the military to attacks with weapons designed to produce electromagnetic pulse (EMP) effects… The homeland might be attacked by terrorists or even by state actors with an eye to crippling the U.S. economy and American society.”

**Shipborne “anonymous” EMP attack**

Dr. Butt alleges that state sponsors of an “anonymous” shipborne EMP attack would have to be “suicidally optimistic.” Dr. Butt recommends the United States deter such an attack by relying on nothing but bluff. Such defenses as Dr. Butt recommends against shipborne EMP attack are, indeed, suicidally optimistic:

First, Dr. Butt recommends relying on presumed foreign ignorance of nuclear forensics to deter an “anonymous” shipborne EMP attack, even while acknowledging that nuclear forensics are not yet capable of identifying an attacker. Dr. Butt: “While nuclear forensics are not well enough developed to assuredly ascribe the origin of a nuclear explosion, even their current state of development would, in some measure, dissuade the leaders of a nation from seriously contemplating such an attack.” Dr. Butt forgets that an EMP attack detonates the warhead at high altitude, in outer space—leaving no bomb debris on the ground for nuclear forensics detectives to collect, and so leaving no “fingerprints,” even if forensics could detect them.

Second, Dr. Butt recommends relying on presumed foreign ignorance of DSP satellite capabilities to deter an “anonymous” shipborne EMP attack, even while acknowledging that DSP could not really identify the attacker. Dr. Butt: “Furthermore, the US certainly has data, via its DSP satellites, on the infrared (IR) signatures of the rocket exhausts from the missiles of various countries. Though these signatures are probably virtually identical for the Scud/Shahab/No-dong family of missiles, the nations which may entertain such attacks do not necessarily know whether… the DSP data can discriminate between a KN Nodong versus an Iranian Shahabs…”

The DSP satellite was designed to provide early warning of Soviet or Chinese strategic missile launches, from their known ICBM fields, not to identify the national origins of short- and medium-range missiles. Any competent foreign intelligence service with a public library card would know this, and much else besides about the capabilities and limitations of DSP. In fact, the “signatures” of medium-range missiles from such countries as North Korea, Iran and Pakistan would be virtually identical, as they are all based on North Korea’s Nodong, which itself is derived from Scud missiles of Russian design. Over 30 nations worldwide possess Scud missiles, all virtually identical, that could be used to make an EMP attack. Anyone can purchase Scud missiles on the world market. Terrorists in North Yemen have them. Prior to 9/11, an American collector purchased a live Scud, with dummy warhead, for his museum.

Large Phased Array Radars (LPARs) are the best tools the United States has for meticulous threat assessment against an incoming missile. An EMP attack, because of its abbreviated trajectory, especially if launched from a ship, leaves too little time for warning, let alone identification of the exact make of the missile. An EMP attack launched from the Gulf Coast would avoid LPARs entirely, as there is no radar facing in that direction.

If a rogue state were really concerned about their ship-launched missile being identified as to national origins, they could always buy someone else’s missile. Many of Saddam Hussein’s Scuds and other missiles are missing from Iraq. Some 100 Scuds belonging to the Taliban are missing in Afghanistan, unaccounted for. These and other missiles can probably be purchased on the black market.

Finally, rogue states are unlikely to be intimidated by DPS or LPARs, as they have seen US satellites and radars fail in battle during the first Persian Gulf War. The one victory achieved by Saddam Hussein in that conflict was the survival, reloading, and repeated firing of his mobile missile launchers, despite the best efforts of US DPS satellites and AWACs radar aircraft to locate and destroy them. This failure of America’s vaunted technology was seen on television and celebrated throughout the Arab world.

Dr. Butt’s “deterrent” to a shipborne EMP attack, relying on technologies that he himself acknowledges will not work, would gamble the survival of the American people on the presumption that our adversaries are stupid. Even if they are, rogue states can always buy anything they need to know about our defenses from Russia. That is how the Serbs managed to shoot down the “crown jewel” of our Air Force, the F-117 stealth fighter, during the Balkans War.

**Biggest bang for the buck**

Dr. Butt argues that terrorists or rogue states would prefer to use a nuclear weapon “in a simple spectacular ground-burst that will destroy a large part of a city, and not risk the complications—and likely failure—of a lofted EMP strike…” Dr. Butt:

The risk versus reward calculation for both terrorist cells and so-called “rogue” states would almost certainly force their hand to a spectacular and direct ground burst in preference to an unreliable and uncertain EMP strike.

Dr. Butt assumes that smuggling a nuclear weapon into the United States, and detonating the weapon in a city, is much more easily and assuredly accomplished than an EMP attack. But this is not so.

Terrorists and rogue states are surely aware of the greatly improved and ongoing improvements to US port and homeland security, including the deployment and continued development of technologies to detect smuggled nuclear weapons. They are also aware—and have probably experienced first-hand—the ever increasing effectiveness of US and allied intelligence in monitoring terrorist networks and penetrating terrorist cells. Dr. Butt correctly argues that one of the biggest fears of terrorists or their state sponsors would be the capture of their nuclear weapon by the United States. This is far more likely to happen in an operation trying to smuggle a nuclear weapon into a US city, than in an EMP attack. As soon as the vessel or aircraft carrying a terrorist nuclear weapon enters US territorial waters or air space, the possibility of discovery and interception increases dramatically, and continues to escalate with each phase of the operation drawing closer to target: landing, off-loading, transportation. A single phone call to the US Coast Guard or FBI from a CIA or allied agent who has penetrated the terrorist cell would deliver the bomb into US hands.

The phone call might not come from the CIA, but from one of the terrorists themselves. Terrorists and rogue state special forces are not the Green Berets. Loyalty to their cause, or to the cruel regime they serve, might well be compromised by the temptation to sell their nuclear weapon to the FBI for millions of dollars.

Nor are terrorists or rogue state special forces particularly good at the kind of clandestine operations at which the Green Berets excel. The 9/11 Commission found that the terrorists of September 11th made many mistakes, and would have failed if US security was just a little more vigilant. Rogue state special forces do not have a good record of carrying out penetrative clandestine operations beyond their borders. For example, Saddam Hussein’s plot to assassinate the first President Bush in Kuwait was discovered by Kuwaiti intelligence, and failed spectacularly. A North Korean plot to conduct sabotage operations in South Korea, by landing special forces in a mini-submarine, when the sub became stranded, ended with the suicides of the operatives, and capture of the sub.

Dr. Butt thinks terrorists and rogue states will give great emphasis to optimizing the use of a nuclear weapon—hence his argument that an EMP detonation occur at the optimum height of burst, “the sweet spot” in his parlance. If so, terrorists or special forces seeking to blast a city instead of EMP, should prefer to smuggle their nuclear weapon out of a port or airfield into the population center, preferably somewhere high up, as in a skyscraper, to optimize the blast effects against people. A low yield nuclear weapon detonated shipboard, in a port, will kill surprisingly few people, compared to the optimum attack mode. For this reason, the Department of Homeland Security is looking at scenarios where nuclear terrorists offload their weapon from shipboard onto a speedboat, to avoid port security, land on some remote beach, and transport the bomb to a city. The requirements of such an operation permit only a very small terrorist team to deliver the bomb, allow only a single technician to “baby sit” the bomb, which gets bumped and jostled around so much that the technician is indispensable. A lot can go wrong.

And if everything goes right and the bomb detonates successfully after being manhandled across water, beach, and bumpy roads, things can still go very wrong. A nuclear weapon detonated in a city will leave plenty of debris, and is the optimum scenario for successful forensic analysis to identify its origins—a factor Dr. Butt thinks would deter a state actor in the first place. The blast will destroy part of a city, kill thousands of people, but not incapacitate the United States as a military superpower. Such an attack will virtually guarantee that the United States will eventually find the culprit, and destroy him.

Rogue state leaders, who tend to be paranoid about the loyalty and competence of their own people, considering the above factors, are likely less enthusiastic about smuggling a nuclear weapon into a US city than Dr. Butt.

On the other hand, a shipborne EMP attack eliminates all of the operational risks described above. The ship can be manned with enough security personnel to monitor everybody, to ensure that no last-minute betrayal of the operation occurs. Operating outside US territorial waters greatly reduces the possibility of US interdiction. Ship communications will ensure that terrorist or rogue state leaders can personally oversee and command and control the operation. A freighter can carry as many technicians as are needed to ensure that the warhead and missile are in good working order. Scuds, Shahab-3s, and Nodongs are highly reliable missiles, unlikely to fail. Will the warhead work? Early US atomic bombs, though of experimental design and built with a lot of guesswork, never failed. Fuzing the warhead to guarantee detonation at high altitude can be done easily, with simple, robust, redundant, commercially available technology. The likelihood is probably greater than 90 percent that the warhead will be delivered and detonate at the correct altitude. The EMP effect is inevitable.

The most problematic part of an EMP attack is: will the EMP inflict sufficient damage on critical infrastructures to destroy the United States, to eliminate the US as an actor from the world stage? Even if the EMP attack “fails,” it will probably inflict far more damage, more widespread damage, kill more people, and impose a far more prolonged national recovery than anything that could be achieved by detonating the same nuclear weapon in a city. If the EMP attack “succeeds,” more than two-thirds of the American people could perish within 12 months of the event, and the United States that we know today would probably never recover.

EMP attack offers by far the “biggest bang for the buck.” It is the only nuclear option that offers a prospect for achieving—with a single nuclear missile—the destruction of American civilization.

Dr. Butt fails to mention in his article that Iranian military writings call for making an EMP attack against the United States; that Iran has practiced missile launching from a vessel in the Caspian Sea; and that Iran has detonated several Shahab-3 missiles at high-altitude, as if practicing an EMP attack.

**E1 versus E3 HEMP**

Dr. Butt’s version of the history of U.S. nuclear tests is heavily skewed to give the reader a false impression that there is no evidence E1 HEMP can damage electronic systems, while E3 HEMP does most of the significant damage. Through this false history, Dr. Butt seeks to convince the reader that low-yield nuclear warheads, that would use E1 HEMP as their primary damage mechanism, pose no threat, while high yield warheads, that produce both E1 and E3 HEMP, are the only nuclear EMP threat. Then nuclear E3 HEMP is dismissed by Dr. Butt on political grounds, because allegedly the only nations capable of mounting a nuclear E3 attack, China and Russia, are our economic partners.

In fact, contrary to Dr. Butt, US nuclear tests produced copious evidence that E1 HEMP can damage or destroy electronics. Over 50 years of testing with HEMP simulators has also proved incontrovertibly that E1 HEMP is a serious threat, in some ways more threatening than E3. The EMP Commission also performed tests using HEMP simulators proving that E1 HEMP, even from a low yield nuclear weapon, can destroy modern electronics.

Dr. Butt’s assertion that E3 poses the greatest threat because it couples to long-lines is misleading. E3 does couple well to long power transmission lines and creates a threat to the large EHV transformers. However, E1 couples well to distribution power lines and low voltage cables (as short as 10 meters) in power substations and creates a threat to the electronic controls that operate and protect equipment, including EHV transformers. Clearly, both E1 and E3 HEMP are important for their coupling to long lines, not just E3 HEMP and geomagnetic storms.

Super-EMP weapons are designed to generate E1 HEMP exclusively, and pose the greatest EMP threat in terms of field strengths. However, even if one accepted Dr. Butt’s arguments, that for physical and political reasons we do not have to worry about E1 HEMP from a nuclear EMP attack, we still need to worry about E1 or its equivalent from a non-nuclear EMP attack. Radiofrequency and microwave weapons are readily available to terrorists on the world market. Although these weapons have a much more limited effective radius than a nuclear weapon, a single such weapon, intelligently used, could blackout a city. A few hundred such weapons, intelligently used, could blackout the entire United States.

Dr. Butt advocates protecting only against E3-like fields, that would be generated by a geomagnetic storm, because he believes geomagnetic storms pose the only “real” EMP threat. It should be noted that the protection from geomagnetic storms also provides protection from the E3 HEMP. In addition, it would cost little more to protect against E1 HEMP from nuclear or the E1-like fields from non-nuclear weapons—which are also real threats.

Dr. Butt’s statement “that geomagnetic storms, on occasion, can induce more powerful pulses than the E3 pulse even from megaton type nuclear weapons” is completely wrong. The peak fields that might be produced from a once-a-century “great” geomagnetic storm might reach 20 V/km. Megaton class nuclear weapons can exceed this level. But only about 1 V/km is needed to create serious problems in power grids and long-line communications.

Dr. Butt fails to credit the EMP Commission with pioneering the work on the threat from a “great” geomagnetic storm in 2001. The EMP Commission was warning about the low-frequency electromagnetic threat to the power grid from a geomagnetic storm fully eight years before the National Academy of Sciences study independently verified the work of the EMP Commission.

**Methodology**

Dr. Butt makes much of the fact that there are still individuals who disagree with the EMP Commission’s threat assessment. Dr. Butt’s methodology appears to assume that any dissent from the EMP Commission automatically proves that the commission is wrong. But there will always be those who disagree with any Commission’s findings—no matter that the methodology, research, and analysis are excellent—just as there are those who disagree with the 9/11 Commission, the WMD Commission, or any other commission one cares to name.

The best any commission can do is to hear all points of view, rigorously and fairly examine everyone’s arguments and data, fully and fairly debate the facts, and come to a consensus judgment, submit that judgment for review by expert individuals and institutions, and based on everything learned from this process, arrive at a final consensus, if possible. This the EMP Commission did, and achieved a consensus among the commissioners, who represented a wide array of backgrounds and viewpoints. There will always be those who disagree with the EMP Commission.

Nonetheless, the EMP Commission’s threat assessment and recommendations—the product of eight years of intensive research and analysis unprecedented for this issue—represents the best work so far produced by this nation on EMP, and is the best informed basis for national security policy.

On another point of methodology, Dr. Butt’s philosophy of doing nothing to protect our nation from nuclear EMP attack is based on his belief that rogue states and terrorists would never attempt an EMP attack. Uncertainty about the effectiveness of EMP, Dr. Butt argues, would deter terrorists and rogue states from making such an attack because, as Dr. Butt puts it, they are not “suicidally optimistic.” But one of the things we know for sure about terrorists and rogue states is that they are literally “suicidally optimistic.” Terrorists and rogue states have demonstrated repeatedly that they are willing to take tremendous risks, even commit suicide, in order to achieve their objectives. The 9/11 terrorists took enormous operational risks, and literally committed suicide, as did Afghanistan’s Taliban, committing regime suicide to support the 9/11 operation. Saddam Hussein took suicidal risks, which ultimately cost his life, to invade Kuwait and then to defy the United States and United Nations on WMD inspections. Iran is taking suicidal risks by supporting international terrorism, waging a clandestine war against America in Iraq and against Israel, and defying virtually the entire world by pursuing nuclear weapons. North Korea is taking suicidal risks by exporting missile and WMD technologies, and provoking virtually the entire world with its nuclear and long-range missile tests.

Rogue states like Iran and North Korea are willing to run suicidal risks because they believe their own propaganda—that they are at war with a United States determined to destroy them. From their perspective, they have nothing left to lose, sooner or later will be destroyed, unless they can find a way to deter or defeat the United States. EMP, for all its uncertainties—and those uncertainties are not nearly as great as Dr. Butt would have readers believe—may well look like the answer to such desperate characters.

Dr. Butt’s methodology focuses on uncertainties about the effectiveness of an EMP attack. But he never asks an equally or more important question—how certain are we that our critical infrastructures and very existence as a society would survive an EMP attack? The adversary’s confidence in EMP attack is not more important than our confidence in the survivability of our infrastructures. We know that the critical infrastructures, including the keystone infrastructure—the national power grid—are unprotected from EMP. We know the national power grid is extremely fragile, because of age and reduced reliability margins, and is often operating on the edge of failure.

Uncertainty about our surviving a nuclear EMP attack does not logically support Dr. Butt’s recommendation that we do nothing to ensure our survival. The EMP Commission’s view is that nuclear EMP attack is one of a small number of threats that could potentially be so catastrophic that—regardless of conflicting opinions about the likelihood of the threat—the United States cannot afford to be vulnerable. Since the existence of the nation is at risk, the United States must do whatever is necessary to protect itself from EMP. Likewise, the United States must do whatever is necessary to protect itself against other potentially catastrophic threats—all forms of nuclear terrorism, biological warfare, chemical warfare, cyber attack, and a “great” geomagnetic storm. In the EMP Commission’s view, the priority of these threats should not be in competition for resources. Just as the body needs air, water, and food, all three, to survive; so the minimum requirements of national security policy should be protection against these several threats that are potentially capable of destroying our civilization.

**Other errors**

Dr. Butt tries hard to mislead readers that Department of Defense and other authoritative Commissions disagree with the EMP Commission, and do not regard a nuclear EMP attack as a threat—by quoting outdated or obsolete opinions. For example, Dr. Butt quotes General Marsh dismissing the EMP threat in 1997—four years before the establishment of the EMP Commission.

Dr. Butt misrepresents the views of the 2009 Strategic Posture Commission on the EMP threat, implying that the Strategic Posture Commission disagrees with the EMP Commission. Dr. Butt: “The 2009 Strategic Posture Commission puts it more delicately by saying that ‘the Commission is divided over how imminent a threat this is…’” Dr. Butt quotes the Strategic Posture Commission out of context. The Strategic Posture Commissioners are unanimous that EMP is a threat, disagreeing only over whether the threat is immediate or longer term. In fact, the Strategic Posture Commission independently arrived at the same consensus view as the EMP Commission—that terrorists and rogue states could inflict a catastrophic EMP attack on the United States. The Strategic Posture Commission urges immediate implementation of EMP Commission recommendations to protect the national power grid. According to *America’s Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*:

Lastly, the United States should take steps to reduce the vulnerability of the nation and the military to attacks with weapons designed to produce electromagnetic pulse (EMP) effects. We make this recommendation although the Commission is divided over how imminent a threat this is. Some commissioners believe it to be a high priority threat, given foreign activities and terrorist intentions. Others see it as a serious potential threat, given the high level of vulnerability. Those vulnerabilities are of many kinds. U.S. power projection forces might be subjected to an EMP attack by an enemy calculating—mistakenly that such an attack would not involve risks of U.S. nuclear retaliation. The homeland might be attacked by terrorists or even by state actors with an eye to crippling the U.S. economy and American society. From a technical perspective, it is possible that such attacks could have catastrophic consequences… The EMP Commission has recommended numerous measures that would mitigate the damage. The Stimulus Bill of February 9, 2009, allocates $11 billion to DOE for “smart grid activities, including to modernize the electric grid.” Unless such improvements in the electric grid are focused in part on reducing EMP vulnerabilities, vulnerability might well increase.

Dr. Butt misrepresents the official position of the Department of Defense on the EMP threat. The Secretary of Defense and his representatives have notified the Congress by letter and in hearings that the department concurs with the EMP Commission’s threat assessment, and will implement the commission’s recommendations. A new directorate has been created within the Office of the Secretary of Defense dedicated to EMP protection. Military training events and exercises were held in 2010 featuring EMP scenarios. Under the FY2009 National Defense Authorization Act, the Defense Department is required to report to Congress until 2015 on progress toward implementing the EMP Commission recommendations.

Dr. Butt asserts the following: “Although the EMP Commissioners have offered a Chinese-language PowerPoint presentation outlining the effects of EMP devices as evidence that China has an interest in such weapons, this presentation is actually of Taiwanese origin… and it is not pertinent to any official Chinese military document.” No member or staff of the EMP Commission has ever misrepresented the Taiwanese PowerPoint on EMP as originating from the People’s Republic of China. However, Taiwan is an excellent source of intelligence on China, just as Israel is on the Middle East, and South Korea is on North Korea. The briefing, from Taiwan’s National Defense University, alleges that China has developed Super-EMP weapons, having very low yield, working from nuclear weapons design information stolen from the United States. There is no dearth of Chinese military doctrinal writings on EMP and its efficacy against the United States.

Dr. Butt’s reliance on the work of Sandia Labs examining the vulnerability of nuclear power plants in the early 1980s, nearly 30 years ago, is misplaced, as the work is now obsolete. Digital controls were not as prevalent then, or as vulnerable to E1, as they are today.

Dr. Butt’s statement that the “Earth’s magnetic field varies across the globe and also varies with time at a given location” apparently confuses the geomagnetic field created by the Earth’s core with the very minor variations in the geomagnetic field by the telluric variations (typically a few nT). The geomagnetic field variation induced by a geomagnetic storm or nuclear E3 HEMP can be on the order of several thousand nT.

Finally, Dr. Butt describes Dr. Peter Vincent Pry as one of the EMP Commissioners. Dr. Pry was not an EMP Commissioner, but was on the Commission staff.

►**Endnotes** available at website version (see source)

***Dr. William Radasky*** *served on the EMP Commission staff and was awarded the Lord Kelvin Medal by the International Electrotechnical Commission (IEC) for his contributions to developing standards for the protection of electronic equipment from high power electromagnetic threats, including HEMP. He is also an EMP Fellow, an IEEE Fellow, and has published over 400 reports, papers and articles dealing with high power EM transients.*

***Dr. Peter Vincent Pry*** *served on the staffs of the EMP Commission, the House Armed Services Committee, the Central Intelligence Agency, and currently is Director of the United States Nuclear Strategy Forum and President of EMPact America.*

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| **What if...**  **Editor wonders**  **http://www.armybase.us/wp-content/uploads/2009/03/north-koreas-taepodong-2-long-range-missile.jpghttp://www.armybase.us/wp-content/uploads/2009/03/north-koreas-taepodong-2-long-range-missile.jpgTaepodong-2 + radioactive material?** |

## Day of the nuclear battery nears

Source: http://www.homelandsecuritynewswire.com/dr20130322-day-of-the-nuclear-battery-nears

Experts in nuclear physics have helped develop research toward a “nuclear battery,” which could revolutionize the concept of portable power by packing in up to a million times more energy compared to a conventional battery.

Nuclear batteries offer power storage increase of a million times conventional batteries // Source: bigstockphoto.com

Experts in nuclear physics at the University of Surrey have helped develop research toward a “nuclear battery,” which could revolutionize the concept of portable power by packing in up to a million times more energy compared to a conventional battery.

A University of Surrey release reports that by capturing charged particles in a special storage ring the experts have solved a long-standing problem of how to understand the fundamental structure of an unstable isotope of bismuth, Bi-212, with potential far-reaching consequences. Professor Phil Walker, of the University’s Department of Physics, said: “The new understanding gives us confidence in the nuclear theory, which guides us to the next step of experimentation. It is hoped that this may, in the longer term, lead to the ability to control a form of trapped nuclear energy, with the ability to release the energy on demand.”

Catching the bismuth ions in a storage ring has enabled, for the first time, direct observation of the trapped energy state, resolving a previous inconsistency with theory. Now, the theory can be used reliably to predict other properties of this isotope, and this suggests possible ways to release the trapped energy — which would be a key to unlocking the nuclear battery concept.

Working at the GSI accelerator laboratory in Darmstadt, Germany, an international team of scientists has studied a long-lived excited state, or energy trap, associated with the isotope Bi-212.

The bismuth ions were created by high-energy nuclear collisions and focused into the GSI storage ring, where individual ions were observed as they circulated for several minutes at a time. This capability — observing individual charged atoms over extended periods of time — is world-wide unique to the GSI storage ring, and is opening up a range of scientific investigations into the fundamental properties of matter.

*— Read more in  L. Chen et al., “Direct Observation of Long-Lived Isomers in 212Bi,”* Physical Review Letters *110 (19 March 2013), 122502*

## Boris Berezovsky death prompts precautionary CBRN investigation

# By Stephen Johnson

Source:http://www.cbrneworld.com/news/boris\_berezovsky\_death\_prompts\_precautionary\_cbrn\_investigation#axzz2OTGkQ91E

In the small hours of Sunday morning the story of Boris Berezovsky’s death broke across media.  While there are markers of possible suicide, a recent Russian Forbes magazine article where he talked about life losing its meaning since leaving Russia, and alleged crippling debts, the British Police have learnt never to assume too much when high profile Russians die.

As I type the site of his home near Ascot and surrounding roads are cordoned but little information has come out beyond confirmation CBRN officers are in attendance.

“We are aware the cordon is causing disruption to local residents and we apologize for any inconvenience, but it is important we take all necessary measures to ensure a full and thorough investigation can be carried out.

I would like to reassure residents that we are confident there is no risk to the wider community.

The property is part of a large estate so a number of roads are closed off at the moment and will remain so for the time being.” – Superintendent Stuart Greenfield

As a refresher Boris Berezovsky was believed to have been whom President Putin was referring to when he claimed foreign based forces had been behind the Litvinenko poisoning with Polonium 210.

In any event Berezovsky denied this and redirected the accusation back at President Putin. The Litvinenko case remains open in the UK due to Russian refusals to allow the investigation of key figures.

The presence of CBRN specialists may well indicate concern that Berezovsky has been dispatched in a similar way, although this would seem to undermine accusations that Berezovsky was behind previous poisonings.  Stranger things have happened.

If that is the case the UK authorities are going to be mightily vexed at being the venue for yet another assassination - particular if its one that spreads contamination around.

As the Po210 incident showed the level of expertise required, and equipment, is going to be beyond standard radiation pagers and beat level policemen.  The UK has highly developed specialist teams within London, as well as DSTL and AWE and if its being taken seriously one would expect that level of investigation.  If it isn’t at that level then it would be pretty difficult to make a meaningful assessment of the scene.

#### Stephen Johnson is Deputy Editor and Technical Director (Consulting) at CBRNE World and HazmatResponderWorld. He holds a PhD Defence against Asymmetric Threats from **Cranfield University, UK and worked as** Principal CBRNE Systems Engineer at **Thales.**

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| 24 March 2013British police investigating the death of exiled Russian oligarch and Kremlin critic Boris Berezovsky say a search of his house by chemical, biological and nuclear experts has found "nothing of concern". |

# “Chemical Monitoring” to unlock secrets of the Dimona nuclear reactor

Source: http://i-hls.com/2013/03/chemical-monitoring-of-dimona-nuclear-secrets/

#### After the Dimona reactor was established, David Ben-Gurion reported details of its capabilities to the Knesset, including its power which he rated at 24-26 megawatts. According to foreign sources today, it is claimed that the reactor’s power has reached 150 mega-watts. The Sunday Times has already reported that Mordechai Vanunu, a former employee at the reactor who was convicted in Israel of releasing secret information about the reactor, reported that the reactor produced about 40 kg of plutonium a year.  According to experts about 10 kg of plutonium is required for the production of a single plutonium enabled atomic bomb.

One of the byproducts of plutonium production is Strontium 90 which is emitted from the chimney of the nuclear reactor and has characteristics similar to calcium, a chemical which is absorbed in the bones of animals and plants. The monitoring of this chemical and others and their circulation around the peripheral areas of the city of Dimona can provide a clear answer about the true power of the reactor, the nuclear materials it produces, as well as an ability to determine whether it can be used to make nuclear bombs.

Anyone traveling on the road to Dimona in the direction of the Dead Sea Works and the road to Eilat, can clearly see the ‘shell’ of one of the most open secrets in Israel, the Dimona nuclear reactor dome and a nearby narrow chimney with height of 20 m. Anyone who is familiar with the chemical processes that occur during the operation of the nuclear reactor is well aware that as a result of the reaction in the reactor’s core invisible materials are emitted from the chimney.

Observation post of Dimona reactor core as photographed by Mordechai Vanunu

It has been argued that some of the secrets hidden beneath the surface of the NRC (Nuclear Research Center) were exposed by Mordechai Vanunu, an Israeli who was tried and convicted for treason in 1986. However essential questions remain such as: What is the power of the reactor and what exactly is produced there? or, Why is its existence still classified to this day under a heavy screen of ‘nuclear ambiguity?  It seems that despite the cloak of secrecy, those who know the nature of the chemical activities of nuclear reactors and have examined the variety of publications available, official publications, semi-official publications and those publications defined under the heading of ‘foreign sources’  can figure things out.

Information about the activity of the reactor from its first days is provided by quite a few sites in the Internet world, one of them being an Israeli web-site called ‘Armageddon’ (1). This site claims Dimona is a ‘plutonium production reactor’. Their information offers the following picture: the knowledge and material for the construction of the reactor was provided by France as part of a secret agreement following the Suez War (1956). Construction work began in early 1958 and ended in 1962. The reactor started operating (turned “critical” in professional terms) in 1963, fueled with uranium, cooled by heavy water and power of 24-26 mega-watts. Since the large-scale construction on the site was impossible to hide it was decided by those in charge of the construction of the project, to inform the public that it was a textile factory named’”Dimona Textiles’. Later, when it could no longer be hidden that is was indeed a nuclear reactor, Israel’s then Prime Minister, David Ben-Gurion, was forced to provide an explanation to the public.  The following is the statement that was issued by him in the Knesset on December 21, 1960:

“We see the development of the Negev as a main goal over the next decade and supported by multi-sided scientific research. For this purpose, we have established an Institute of Scientific Research in Beersheba in order to learn about the wilderness, flora and fauna of the desert. As such we are currently building a research thermal reactor with a power of 24,000 kilo-watts which will serve the needs of industry, agriculture, medicine and science, as well as for training scientists and Israelis in the technique necessary for building a nuclear power plant in the future, as we assume, in 10 to 15 years. The research reactor we are currently building in the Negev is intended solely for peaceful purposes, and was built under the management of Israeli experts. “

The Chemical process in the reactor was fueled by enriched uranium producing (as a byproduct) the radioactive element called plutonium, which is one of the two elements required to produce an atomic bomb. (2). According to foreign reports published by the British Sunday Times, the Israeli nuclear reactor produced about 40 kg of plutonium per year, information leaked to the world during the Vanunu spy affair,. This number was not necessarily accurate given the fact that uranium production depends on the power of the reactor. However, according to foreign reports, Israel has secretly increased the reactor’s power to 70 mega-watts and then to 150 mega-watts over the past years.

After French President, Charles de Gaulle ordered the imposition of an embargo (3) on Israel, it began to move its activities in the procurement of weapons and nuclear material detection to the United States The outcome was inevitable and with its curiosity having been aroused, American intelligence sought information and the U.S. sent observers to Israel in the 60s.  Heavy diplomatic pressure was put on Israel stemming all the way to the presidential level, in an attempt to curb Israel’s plans and to deny her the knowledge and ability to produce nuclear weapons.

The irony is that despite all the intelligence and diplomatic exercises which countries in the world had invested in, especially the United States, the great efforts to uncover the secrets of Israel’s nuclear program, were almost unnecessary in the end. As far as is now known, the international inspectors apparently did not use the procedures that could have ascertained this information earlier through ‘chemical monitoring ‘.  All they needed to detect was just one element, strontium 90, which is emitted from the chimneys of all the world’s reactors, and which is based on the controlled fission of Uranium. Ironically even President John F. Kennedy knew back in the early 60′s of the significance in the presence of strontium 90 in the bones of animals (4), but for reasons which are not clear; it seems the American government had no intention of dedicating great effort and many resources in order to expose the truth.

To understand what operational conclusions can be reached when locating the presence of strontium 90 in flora or fauna of any reactor environment, including the Dimona reactor, it is best to explain what in fact is this unique material.

Strontium is a chemical element found in nature in the form of yellowish mineral compounds. It is similar in its chemical properties to calcium and like calcium has the ability to be absorbed into the human body’s bones and plants. The element strontium is not radioactive, but it turns radioactive when Strontium 90 is produced during the chemical process that occurs at a nuclear energy producer, along with other substances emitted into the air through the chimney of the reactor. Because strontium is a heavy metallic element – heavier than the air, it floats in the air after exiting the chimney and slowly sinks to the ground where it is absorbed in the bones of animals and plants, just like calcium. This process is well known to Chemical scientists who know that an appropriate testing of animal bones as well as plants that have absorbed strontium 90 can reveal exactly how much radioactivity is inherent in the bone and as a result can also determine the production capacity of the reactor as well as its power output.

The half-life of strontium 90 reaches 18 years on average, compared with three times larger duration by plutonium 238 produced in uranium operated nuclear reactors. For this reason it is clear that you can track the existence of the material for years after it was formed. Strontium 90 also exists in solid nuclear waste formed by reactors and is considered the most dangerous material in its radioactive form. Strontium 90 also exists in the fallout following a nuclear explosion. Through the measurement of quantities and comparing the results to data published in the world regarding plutonium and strontium 90 elements produced in nuclear reactors  as well as other materials, the secrets of the Dimona reactor can be deciphered.

If the U.S. had wanted to find out about the roadmap of the nuclear reactor in Dimona all it had to do was send research teams to Dimona’s geographic area, measure the winds in the reactor’s vicinity, collect plants, animals and animal remains, and check for the basic content of strontium 90. Findings from these efforts could have, and still can, provide a clear answer about the power capacity of the reactor, which nuclear materials it produces, and whether it can make atomic bombs of any kind.

Using common sense, it is likely that over the years, had U.S. envoys in the Middle East curiously monitored the ‘chemical monitoring’ path around the Dimona reactor, the conclusions would have been clear regarding what is called ‘Israel’s nuclear option’.

Who can assure us that those events didn’t occur?

1) All information about ‘Armageddon’ was collected from open sources and published in newspapers and on Internet sites in Israel and abroad.

2) Both U.S. atomic bombs dropped on Japan almost 70 years ago were made on the basis of the fission of these two elements – enriched uranium (Hiroshima bomb) and plutonium (Nagasaki bomb). Approximately 8-10 kilograms of plutonium is required to manufacture a nuclear bomb.

3)  The embargo (ban) on arms exports from France to Israel was imposed shortly before the Six Day War and resulted in the end to the era of security cooperation between Israel and France.

4)  Strontium 90 penetrates into a living organism (human or plant) mainly through the foods that it consumes. 70-80% of strontium reaching the living body is absorbed in the bones and one percent is absorbed in the blood and soft tissues. The presence of strontium 90 in living body can be examined by biopsy and / or urine test. These facts were revealed by an American scientific team of researchers led by Dr. Lewis Reiss, while examining teeth that had fallen from the mouths of young children and found that the teeth of children born in 1963 contained remnants of strontium 90, 50 times greater than the amount found in children born in 1950. The oddity was due, as it turned out, to the increase in the number of nuclear tests conducted in the U.S. Because of the importance of this information to public health research, the results were presented to President John Kennedy. The result caused Kennedy to formulate in cooperation with Britain and the Soviet Union, a Convention to significantly reduce the number of nuclear tests.

#### ►Watch also this video: <http://www.youtube.com/watch?v=CxkDMt0-nTs&feature=player_embedded>

# Russia reports 25,000 undersea radioactive waste sites

Source: http://en.rian.ru/Environment/20111226/170500108.html

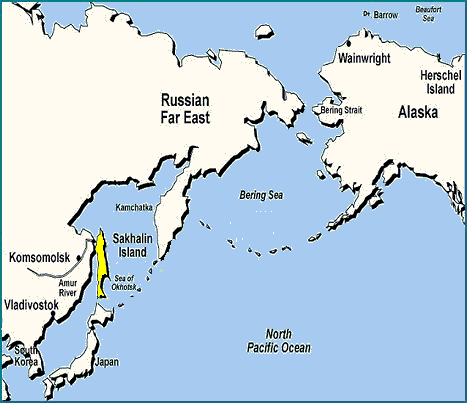
There are nearly 25,000 hazardous underwater objects containing solid radioactive waste in Russia, an emergencies ministry official said on Monday.

The ministry has compiled a register of so-called sea hazards, including underwater objects in the Baltic, Barents, White, Kara, and Black Seas as well as the Sea of Okhotsk and the Sea of Japan, Oleg Kuznetsov, deputy head of special projects at the ministry’s rescue service, said.

These underwater objects include nuclear submarines that have sunk and ships with ammunition and oil products, chemicals and radioactive waste.

Their condition has been closely monitored for the past 15 years by ministry specialists.

The danger is that metal containers can eventually be eroded by sea water, resulting in the leak of hazardous substance.

Hazardous sites with solid radioactive waste sit on the sea bed mainly at a depth of 500 meters, Kuznetsov said.

Especially dangerous are reactor holds of nuclear submarines off the Novaya Zemlya Archipelago and a radio-isotope power units sunk near Sakhalin Island, he added.

“Should a major threat to the environment and people arise then the state will take effective measures to eliminate it,” he said.

Radioactive waste disposal

Source: http://en.rian.ru/infographics/20100211/157844295.html

# Radioactive waste disposalMoscow Police Seize 14 Kg of Radioactive Material from College Teacher

Source: http://en.rian.ru/crime/20130325/180235915.html

MOSCOW, March 25 – Moscow police have detained a college teacher who had a large amount of radioactive substances in his home, the Interior Ministry said on Monday.

A total of 14 kilograms of “dangerous substances” were discovered in an apartment and garage belonging to the teacher, 35, whose name was not disclosed.

The ministry did not elaborate on the nature of the substances or their origin.

The police cited the man as saying that he had **used the substances to “irradiate” a friend who wanted to become immortal.**

He reportedly said the friend had even traveled to the site of the 1986 Chernobyl nuclear disaster “to expose himself to radiation and become immortal.”

The detainee said he had acquired the radioactive objects by “going to special places and burial sites,” without giving further detail, according to the police.

A criminal case has been opened on charges of “illegal handling of nuclear materials or radioactive substances,” which carries a prison sentence of up to seven years.

**Understanding the Current State of the Iranian Nuclear Challenge**

Source: http://jcpa.org/article/understanding-the-current-state-of-the-iranian-nuclear-challenge/

To produce its first atomic bomb from 20 percent enriched uranium, Iran would need a stockpile of 225 kilograms, which upon further enrichment to the weapons-grade level would yield the 25 kilograms of uranium metal for a nuclear warhead. Since it began enriching 20 percent uranium, Iran had produced 280 kilograms of this material – well above the Israeli red line drawn by Prime Minister Netanyahu. But it had removed a total of 112.6 kilograms of this 20 percent stockpile, leaving itself with a net total of 167 kilograms of 20 percent enriched uranium. This changed the entire timeline of the Iranian bomb, pushing it off from the fall of 2012 to a later date.

In May 2011, the IAEA raised concerns about the “possible existence” of seven areas of military research in the Iranian nuclear program, the last of which was the most alarming: “the removal of the conventional high explosive payload from the warhead of the Shahab-3 missile and replacing it with a spherical nuclear payload.” In November 2011, material that the IAEA presented pointed clearly to the fact that Iran wanted to develop a deliverable nuclear weapon. The planned warhead design also underwent studies that investigated how it would operate if it was part of a missile re-entry vehicle and had to stand up to the stress of a missile launch and flying in a ballistic trajectory to its target. The IAEA concluded that “work on the development of an indigenous design of a nuclear weapon including the testing of components” had been executed by the Iranians.

Iran is not a status quo power. A few years after he assumed the position of Supreme Leader of Iran, Ayatollah Ali Khamenei gave a revealing interview to the Iranian daily *Ressalat*, in which he asked a rhetorical question: “Do we look to preserve the integrity of our land, or do we look to expansion.” He then answered himself, saying: “We must definitely look to expansion.” This world view is still sustained to this day. Khamenei’s senior adviser on military affairs, Major General Yahya Rahim Safavi, who was the previous commander of the Revolutionary Guards, described Iran in 2013 as “the regional superpower” in the Middle East.

In the meantime, Iran has substantially increased the number of centrifuges that it installed for uranium enrichment. It also introduced its more advanced centrifuges into its nuclear facilities and it is making progress on its heavy water reactor that will allow it to produce plutonium. Iran, so far, has been careful not to cross the Israeli red line, but that hasn’t prevented it from moving ahead on other aspects of its program. Indeed, just after the last P5+1 talks in Kazakhstan, Tehran announced it was building 3,000 advanced centrifuges that it intended to install at Natanz.

Thus, if proposals are to be made that protect the international community as a whole from the threat of Iranian nuclear weapons, they must address other aspects of the program which might become fully operational in the years to come: the plutonium program, weaponization, delivery vehicles, and continuing upgrade of Iran’s centrifuge technology. If negotiations only halt one aspect of the Iranian effort to reach nuclear weapons, while letting the other parts of the program go forward, they may preclude an immediate crisis, but the world will still face a new Iranian challenge in the years ahead.

Over the last decade, a clear international consensus has slowly emerged that Iran was not just pursuing a civilian nuclear program, as Tehran argued, but rather was seeking nuclear weapons. True, the Nuclear Non-Proliferation Treaty guarantees the right of signatories, like Iran, to use nuclear energy for peaceful purposes, but that did not include a right to enrich uranium in order to produce indigenous nuclear fuels that could be employed for nuclear weapons.

Many countries with nuclear power infrastructures, like South Korea, Finland, Spain, and Sweden, actually received their nuclear fuels from abroad.1 Even in the U.S., 92 percent of the uranium used in 2010 by nuclear power plants was of foreign origin.2 But unlike these other cases, Iran chose to establish its own uranium enrichment infrastructure at Natanz and suspiciously kept it totally secret from the world until 2002, when it was revealed by the Iranian opposition. A second secret enrichment facility, near Qom, buried deep inside a mountain, was disclosed in 2009.

Because of the way Iran proceeded with its nuclear program, international suspicions of its purpose only increased. The official Iranian line that its nuclear infrastructure was for the production of electricity lost all credibility over time, especially in light of its enormous oil and gas reserves which were a far more economical source of energy. In February 2006, French Foreign Minister Philippe Douste-Blazy bluntly stated that “it is a clandestine military program.”3

Even the Russians could no longer protect what Iran was doing by saying that it was for purely civilian purposes. Thus, Russian President Dmitry Medvedev frankly admitted in July 2010, “We are not indifferent to how the military components of the corresponding [nuclear] program look.”4 Using careful language, James R. Clapper, President Obama’s Director of National Intelligence, reported to the Senate Select Committee on Intelligence on March 12, 2013, that Iran’s technical advancements “strengthen our assessment that Iran has the scientific, technical, and industrial capacity to eventually produce nuclear weapons.” For Washington, it was no longer a question of whether Iran wanted a nuclear bomb, but rather when it would decide to build it.

**The Israeli View**

In successive public appearances during the month of September 2012, Prime Minister Benjamin Netanyahu laid out what he believed was the timeline for Iran to cross the nuclear threshold and acquire an atomic bomb. In a September 16 interview with CNN’s Candy Crowley, he stated that the Iranians were moving into the final phase of their nuclear work, saying that they were entering a “red zone” in which they were coming extremely close to achieving their goal. He specified during the interview that this meant that within six months the Iranians will have accumulated a sufficient quantity of uranium at a level of enrichment that is 90 percent of the way to completing an atomic bomb.

The prime minister restated this same idea during his address to the UN General Assembly on September 27, when he said that after this 90 percent point, what he characterized as the final phase of enrichment would only require “a few months, possibly a few weeks.” Looking at the trends in the Iranian nuclear program as a whole, he warned during his address: “the hour is getting late, very late.” For that reason, he declared that a clear red line needed to be drawn in front of the leadership in Tehran before the Iranian program entered into this final phase of enrichment and was still within the second phase of enrichment.

To understand the phases of the Iranian program to which Prime Minister Netanyahu referred, it is important as background to recall that nuclear scientists have long explained the levels of enrichment as follows. Uranium comes in several isotopes: U-235, which can undergo nuclear fission, thereby releasing the explosive energy of an atomic bomb, and U-238, which is not usable for this purpose. But natural uranium is made up of only an infinitesimal amount of the potentially explosive U-235, approximately 0.7 percent, and a much larger proportion of U-238, approximately 99.3 percent. Enrichment involves increasing the percentage of U-235 isotope in uranium, usually by spinning uranium as a gas in thousands of centrifuges, and taking away the less useful U-238.

What did the prime minister mean when he said that Iran had reached level of enrichment with its uranium that is 90 percent of the way to a bomb? When uranium is enriched to the 3.5 percent level, in the first phase of enrichment, it is called low-enriched uranium and is mainly a suitable fuel for a civilian nuclear reactor producing electricity. Given the low starting point of U-235 in natural uranium, the amount of energy required to reach even this first level of low-enrichment is about 70 percent of the total energy needed to get to weapons-grade uranium. In other words, when Iran enriches uranium to the 3.5 percent level it has essentially advanced 70 percent of the way to the weapons-grade level.

More alarmingly, when Iran reaches the second level of enrichment, meaning 20 percent enriched uranium, it is essentially advancing 90 percent of the way to weapons-grade uranium. By beginning the last sprint to weapons-grade uranium from feedstock that is already at the 20 percent level, Iran could cut in half the time needed to undertake the same enrichment if it started with only 3.5 percent uranium. In short, a stock of 20 percent enriched uranium is ideally suited for what security experts call “nuclear breakout” – a rapid move by a state with what it declares to be a civilian nuclear industry if it wants move to a nuclear weapon, in violation of its commitments to the international community.

In his UN address, Prime Minister Netanyahu was saying that the international community must warn Iran that it will not be allowed to complete the production of enough 20 percent enriched uranium for its first atomic bomb. Like in his CNN interview, he stated during his UN address that Iran might cross this threshold by next spring or at the latest by next summer, but he carefully conditioned this assessment on the assumption that Iran maintains its current enrichment rates, leaving open the possibility that they could be accelerated.

For example, if Iran outfitted its uranium enrichment facilities with large numbers of more advanced centrifuges, like the IR-2M, that operate at four or six times the speed of the current IR-1 model they mostly use, then the rate of Iranian enrichment could be dramatically accelerated. Iran formally notified the IAEA on January 23, 2013, that it was going ahead and installing the IR-2M centrifuges. Alternatively, if Tehran installed and began to operate many more IR-1 centrifuges, then the volumes of uranium that the Iranians could process would also increase substantially.

**The Failure of Past International Pressures on Iran**

The world was not supposed to be in this kind of position at present. Since 2002, when the Iranian clandestine nuclear program was first revealed by the Iranian opposition, the main diplomatic assumption held across the international community was that a mixture of international sanctions and negotiations would force Iran to give up its military nuclear program. Subsequently, it was also thought that the threat of the use of force would compel Iran to halt its nuclear work.

Iran’s concealment of its nuclear activities, particularly its work on uranium conversion, uranium enrichment, and plutonium separation constituted outright breaches of its international obligations under its 1974 Safeguards Agreement that had been concluded in accordance with the 1968 Nuclear Non-Proliferation Treaty. Attention was particularly drawn at this time to the large uranium enrichment facility at Natanz.5

Iran’s violations of its treaty obligations were serious. As a result, diplomatic pressures were placed on Iran that appeared to be impressive. From 2006 onward, six UN Security Council resolutions were adopted that called on Iran to halt all uranium enrichment activity. Moreover, just like the resolutions adopted against Iraq under Saddam Hussein in the 1990s, these resolutions against Iran were adopted under Chapter VII of the UN Charter making them binding international law.

Yet this global effort against Iran clearly failed, for the resolutions plainly had no impact on Iranian decision-making. After UN sanctions were first imposed under Resolution 1737, in late 2006, the Iranians began enriching uranium anyway in February 2007 in ever growing quantities. It was also at this time that, despite UN pressures, Iran constructed a second secret enrichment facility, which was dug deeply into the side of a mountain at Fordow, near the city of Qom.

By 2009, Iran’s stocks of low-enriched uranium first went above 1,500 kilograms – the minimal amount for producing the quantity of weapons-grade uranium needed for a single atomic bomb. A little less than a year later, in February 2010, despite ongoing UN sanctions, Iran for the first time produced uranium at its Natanz facility enriched to the 20 percent level, which, as noted earlier, could be converted to weapons grade uranium in half the time in comparison with uranium at the low-enriched level. The Iranians began to enrich uranium to the 20 percent level at their Fordow facility in December 2011.

The Iranian regime also used these years to unilaterally alter the rules affecting the involvement of the International Atomic Energy Agency (IAEA) in its nuclear program in order to erode some of its most important restrictions. For example, Iran is required to notify the IAEA that it has decided to construct a new nuclear facility the moment such a decision is taken. In other words, even when construction begins for a new nuclear facility, the IAEA should be fully informed. In the technical jargon of the IAEA this obligation is known as “modified Code 3.1” and was formally accepted by Iran in an exchange of letters between Iran and the IAEA in February 2003.6

But in March 2007, Iran suddenly declared that it was suspending its acceptance of this obligation and going back to earlier IAEA rules that only required Tehran to declare a new nuclear facility six months before it receives nuclear material for the first time. This was not just a technicality. For having loosened the IAEA’s restrictions, the Iranians then argued that their formerly secret enrichment facility at Fordow, which was revealed in 2009, did not violate their legal obligations to the IAEA. Clearly the pressures placed on Iran by the UN Security Council during 2006 and 2007 were insufficient to prevent Tehran from taking such actions.

Then Tehran came up with the excuse that it needed 20 percent uranium for manufacturing medical isotopes at the Tehran Research Reactor. But the quantities of 20 percent uranium produced have by the admission of Iranian officials themselves exceeded their own domestic requirements for this purpose. Indeed, in an August 2011 interview published by the Iran News Agency, Fereydoun Abbasi-Divani, the head of the Iranian Atomic Energy Organization, admitted that the quantities of 20 percent enriched uranium produced “already exceeded the required amount for the Tehran Research Reactor.” The latest transparent excuse for further enrichment has been an Iranian proposal that they might have to enrich up to 90 percent uranium for powering nuclear reactors for future nuclear submarines.

Enriched uranium was not the only fuel that the Iranians planned to use for assembling a nuclear bomb. Since the first revelations about their nuclear program in 2002, it was known that Iran was building a heavy-water production plant at Arak, as well as a heavy-water nuclear reactor. Iran could extract plutonium fuel rods from the heavy-water reactor and reprocess them for producing weapons-grade material. The uranium route to an atomic bomb would still be shorter for Iran than the plutonium route, since Tehran will only first begin to operate its Arak reactor during the first three months of 2014, according to notification it gave to the IAEA.7

**Time Line to an Iranian Bomb**

If the countervailing pressures of the international community against Iran do not get it to halt its 20 percent enrichment, then when is it likely to obtain sufficient quantities of uranium at this level of enrichment that allow it to move quickly to the weapons-grade level and subsequently assemble its first nuclear bomb? According to the August 2012 IAEA report, Iran had already produced at that point a total of 189.4 kilograms of 20 percent uranium since it began to enrich to this level in February 2010.

To produce its first atomic bomb from 20 percent enriched uranium, according to the Institute for Science and International Security (ISIS), Iran would need a stockpile of 225 kilograms, which upon further enrichment to the weapons-grade level would yield the 25 kilograms of uranium metal for a nuclear warhead.8 In professional circles a “bomb’s worth” of high-enriched uranium is called a “significant quantity.” Iran should have been able to accumulate an adequate quantity of 20 percent uranium for one bomb by the end of October 2012, assuming it maintained its recent rate of production of 14.8 kilograms per month, using both of its enrichment facilities at Natanz and Fordow. Thus, the Iranians should have hit Prime Minister Netanyahu’s red line this past fall.

However, between December 2011 and August 2012, Iran drew down from its 20 percent stock by 96.3 kilograms, which it used to manufacture other uranium products, like uranium oxide powder for fuel plates. As a result, the net stock of 20 percent uranium fell to 91.4 kilograms. This changed the entire timeline of the Iranian bomb. According to the recent February 2013 IAEA report, Iran indeed continued its dual track approach to uranium enrichment in the first months of the year: it produced more 20 percent uranium and at the same time removed some of its 20 percent stock in order to produce other uranium derivatives that were not immediately useful for the eventual production of weapons-grade uranium. ISIS concluded on the basis of the February report that since it began enriching 20 percent uranium, Iran had produced 280 kilograms of this material – well above the Israeli red line drawn by Prime Minister Netanyahu. But it had removed a total of 112.6 kilograms of this stockpile, leaving itself with a net total of 167 kilograms of 20 percent enriched uranium.

Assuming Iran maintains its recent rate of production of 14.8 kilograms per month, and does not divert more 20 percent uranium for other uses, it should accumulate enough 20 percent uranium for a single bomb by the summer of 2013. For this reason, it is possible to project that Iran might hit the Israeli red line at that time. As stated earlier, this could happen even earlier if Iran manages to increase the rate of enrichment, especially if it utilizes centrifuges that have been installed but are not yet operational.9

For example, Iran installed 1,076 centrifuges in its Fordow facility between May and August 2012, bringing the number of centrifuges in Fordow alone to 2,140. Of that total only 646 centrifuges were actually operating. But Iran could substantially accelerate its production of 20 percent uranium in the months ahead if it decides to utilize all the new centrifuges it is in the process of installing. This would cut the time needed in half to produce enough 20 percent uranium that could be further enriched to the weapons-grade level.

Of course, Iran could reconvert its uranium oxide powder back to uranium gas for injecting into its centrifuges for further enrichment. Moreover, Iran also has a huge stock of 3.5 percent enriched uranium, which according to the February 2013 IAEA report reached 5,974 kilograms (after subtracting the uranium that was enriched to 20 percent). This stock alone could provide enough weapons-grade uranium for at least 3 to 4 atomic bombs, after further enrichment. But enriching from the 20 percent level would be the fastest way for the Iranians to break out and establish a *fait accompli*.

It is important to note that there are further steps that Iran must undertake to reach a nuclear weapon, whenever it amasses enough 20 percent uranium for its first bomb and enriches that stock to the weapons-grade level. Most estimates of the time needed to make this leap to weapons-grade uranium are between two and four months. All uranium enrichment requires uranium in a gaseous form: by spinning the gas at high speeds in a centrifuge the heavier U-238 can be separated from the lighter U-235, which is needed for a fission bomb. But once Iran has weapons-grade uranium as a gas, it needs to convert it into a metal for fashioning a nuclear warhead, which takes additional time.

The problem with precisely calculating time lines is also made complicated by the size of the weapon that Iran decides ultimately to make. As noted earlier, the IAEA established that further enrichment of this uranium must yield 25 kilograms of weapons-grade uranium for a nuclear explosive device. Yet critics charge that this number should be far lower. Even 15 kilograms of weapons-grade uranium would be sufficient for a bomb (historically, the U.S. conducted a nuclear test in 1951 with only six kilograms of high-enriched uranium).10

The Iranian timeline to an atomic bomb would thus be influenced by whether they seek to produce 25 kilograms of weapons-grade uranium or decide to settle on an initial device with less nuclear material and a smaller nuclear explosive yield. This difference could bring Iran much closer to crossing the nuclear red line much sooner.

**Nuclear Warhead Design**

There are, of course, three dimensions to any nuclear weapons program: enriched uranium, ballistic missiles, and nuclear warheads. The latter issue also grew in importance for the IAEA. This began to become evident in February 2008 when Olli Heinonen, then IAEA deputy director-general, gave a highly classified briefing to representatives of more than 100 states. According to a description of the meeting reported by David Sanger of *The New York Times*, Heinonen displayed original Iranian documents that he stressed came from several member states of the IAEA, and not just from the U.S.11 In June 2010, the German newspaper *Der Spiegel* reported that the material came from a joint operation by German and American intelligence agencies. The IAEA had the international standing to authenticate U.S. intelligence reports for those who doubted their veracity. When the IAEA said they were true, many more states were willing to accept them.

The Iranian documents detailed how to design a warhead for the Shahab-3 missile, which has been operational in the Iranian armed forces since 2003. While the Iranian documents made no reference to a nuclear warhead, they did show the arc of a missile’s flight and that the warhead of the missile had to be detonated at an altitude of 600 meters. To the IAEA experts, a conventional explosion at that altitude would have no effect on the ground below. But 600 meters was the ideal altitude for a nuclear explosion over a city. As Sanger points out, it was in fact the height of the Hiroshima explosion. Despite the substance of his presentation, Heinonen did not yet say that the Iranians were producing nuclear weapons, but he left his audience in Vienna with many questions they had not asked before.

By May 2011, the IAEA became far more explicit in its report on Iran than Heinonen had been in 2008. Its report raised concerns about the “possible existence” of seven areas of military research in the Iranian nuclear program, the last of which was the most alarming: “the removal of the conventional high explosive payload from the warhead of the Shahab-3 missile and replacing it with a spherical nuclear payload.”

Yet, the IAEA was not ready to say it had reached any conclusions. It only sought “clarifications” about its suspicions.

The most important of the IAEA reports on Iran was released in November 2011 and proved to be significant in a number of ways. First, it showed that the IAEA no longer had “suspicions” about the Iranian weaponization program – it had what it called “credible” intelligence. The appendix of the report, moreover, devoted a whole section to the “credibility of information.” It was not relying on the Iranian laptop that was at the heart of Heinonen’s 2008 presentation, but also on a much larger volume of documentation. The report states that the agency has more than 1,000 pages of material to substantiate its claims. In case there were suspicions that this material came from U.S. intelligence agencies alone, the report makes sure to clarify that the sources involved “more than 10 member states.”

Second, the material that the IAEA presented pointed clearly to the fact that Iran wanted to develop a deliverable nuclear weapon. The Iranians had sought to obtain uranium for a secret enrichment program that would not be under IAEA safeguards. The uranium that would come out of this clandestine program would be further processed to produce the uranium metal required for a nuclear warhead. The planned warhead design also underwent studies that investigated how it would operate if it was part of a missile re-entry vehicle and had to stand up to the stress of a missile launch and flying in a ballistic trajectory to its target. The IAEA concluded that “work on the development of an indigenous design of a nuclear weapon including the testing of components” had been executed by the Iranians.

**Why Does Iran Persist with Its Nuclear Drive?**

Iran’s audacity in violating its international obligations has surprised many in the West. The Iranian government has paid a steep economic price in terms of international sanctions, but nevertheless continues its drive to obtain nuclear weapons. It is impossible to separate Iran’s determination to acquire nuclear weapons from its broader ambitions to become the preeminent power in the Middle East.

For Iran is not a status quo power. A few years after he assumed the position of Supreme Leader of Iran, Ayatollah Ali Khamenei gave a revealing interview to the Iranian daily Ressalat, in which he asked a rhetorical question: “Do we look to preserve the integrity of our land, or do we look to expansion.”12 He then answered himself, saying: “We must definitely look to expansion.” In essence, he was reflecting what is written in the Constitution of the Islamic Republic, which calls for the “continuation of the Revolution at home and abroad.”13 Khamenei is the commander-in-chief of the Iranian armed forces and hence his definitions of Iranian national strategy are essential to follow.

This world view is still sustained to this day. Khamenei’s senior adviser on military affairs, Major General Yahya Rahim Safavi, who was the previous commander of the Revolutionary Guards, described Iran in 2013 as “the regional superpower” in the Middle East.14 He asserted that a “new global power is emerging in the Muslim world.” He explained that Washington was trying to prevent this from happening.

In the last five years, Iranian spokesmen close to Khamenei have voiced expansionist goals for the Islamic Republic, insisting that Bahrain is an Iranian province and reminding the other Arab Gulf states that they used to be part of Iranian territory. Moreover, on the ground, Khamenei uses the Qods Force of the Revolutionary Guards, under the command of Major General Qassam Suleimani, throughout the Middle East in order to export its revolutionary agenda.

Two years ago, *The Guardian* reported that a senior Iraqi politician gave General David Petreaus a text message in 2008 from Suleimani that read: “General Petraeus, you should know that I, Qassem Suleimani, control the policy for Iran with respect to Iraq, Lebanon, Gaza, and Afghanistan.”15 This story was partly verified this January, when the *Iranian news* *agency* ISNA reported that in a speech about Lebanon and Iraq, Suleimani asserted: “These regions are one way or another subject to the control of the Islamic Republic of Iran and its ideas.”16 Also in January, Iran admitted for the first time that the Quds Force had been deployed in both Lebanon and Syria.

In terms of the Iranian nuclear program, the distinction that Khamenei made between defensive goals for the Islamic Republic, which he did not adopt, and the offensive doctrine that he appeared to embrace, means that an Iranian nuclear weapons capability would not be for the purpose of deterrence alone, as with many other regimes, but for serving its drive to achieve regional hegemony and improve its power position vis-à-vis its Arab neighbors and the U.S. Ali Larijani, who once served as the National Security Advisor of Iran and as its chief nuclear negotiator, made this very point, asserting that “if Iran becomes atomic Iran, no longer will anyone dare challenge it because they would have to pay too high a price.” In short, nuclear weapons secure Iran’s status as a great power that does not have to accept the demands of any other power.17

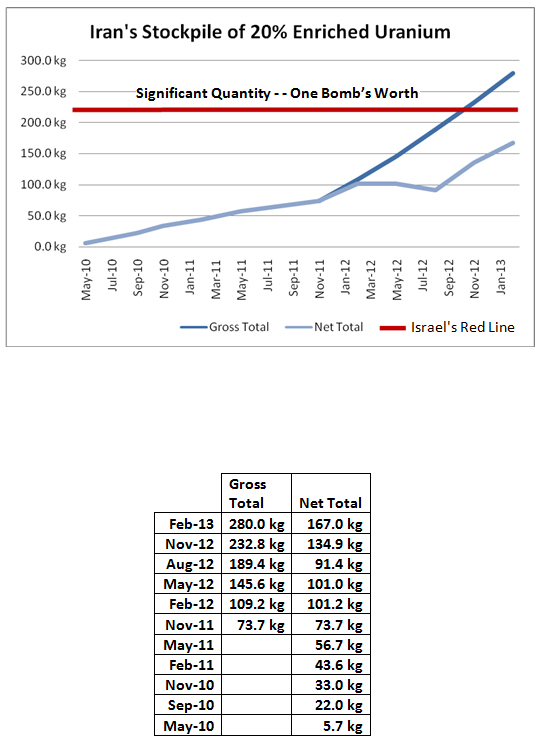
Larijani’s remark is important for understanding another feature of Iran’s drive to cross the nuclear threshold. Recent history demonstrates that once a state like North Korea conducted its first nuclear test, then the U.S. and its Western allies became reluctant to challenge its nuclear status. In contrast, once Libya gave up its nuclear weapons program, the U.S. and its NATO allies felt free to back the revolt in 2011 against the regime of Muammar Gaddafi. Thus advances in the Iranian nuclear program could put it in a position in the near future to be able to deter even the U.S. from taking action against its nuclear facilities because of the risks involved.

Clearly, there are a number of benchmarks that Iran must traverse on its way to a full nuclear weapons capability. First, there is the completion of the minimal quantity of 20 percent enriched uranium needed for manufacturing an atomic bomb after it is enriched further to weapons-grade uranium. Second, there is the manufacture of uranium metal that is used in a nuclear warhead. Third, there is the production of the warhead itself and it being outfitted on a ballistic missile, like the Shahab-3, that can strike Israel, Saudi Arabia, or Turkey, as well as Western forces deployed in those countries. The November 2011 IAEA report on Iran concluded that Iran had worked on a nuclear warhead. A top Israeli official specified that Tehran had already undertaken activities “to integrate a payload on a Shahab-3 missile.”18

**The Final Stages of the Iranian Nuclear Program**

As Iran advances in its nuclear program, it undoubtedly acquires a great degree of deterrence even before it has a fully operational weapon. Looking at the example of North Korea, it removed IAEA surveillance equipment and evicted its nuclear inspectors in December 2002, while telling U.S. officials that it had nuclear weapons in April 2003. The North Koreans only conducted their first nuclear test in 2006 and a second test in 2009. From their experience, the North Koreans probably raised concerns in the West about their having an impending nuclear weapons capability even before their first nuclear test. Two U.S. analysts have written that the U.S. already began adjusting its military planning on North Korea in the late 1990s when intelligence analysts concluded that North Korea was capable of assembling a nuclear weapon. The point is that rogue states began acquiring strategic advantages from nascent nuclear programs even before they make the final assembly of a nuclear warhead for their missiles.19

How would this work in the case of Iran? As the indications mount in 2013 that Iran is making its final preparations to cross the nuclear threshold and become a nuclear weapons state, there will be a renewed debate in the West over the question of the use of military force. But that debate will be clouded with the question of whether Iran already has nuclear weapons. Presumably those who will assert that Iran already has nuclear weapons will argue that any preventive strike will be too risky at this point in time. The main problem is that at this stage intelligence agencies will be operating largely in the dark.

This point has been made occasionally even by senior levels in the U.S. Appearing on NBC’s “Meet the Press,” on April 11, 2011, former Secretary of Defense Robert Gates made this very point: “If they – if their policy is to go to the threshold but not assemble a nuclear weapon, how do you tell that they have not assembled? So it becomes a serious verification question, and I, I don’t actually know how you would verify that.” Gates’ assessment was particularly significant given the fact the he served as the Director of the CIA in the 1990s and understood better than most officials the true limits of Western intelligence agencies when it comes to the detection of weapons of mass destruction programs.

This explains the enormous risks of letting the Iranian nuclear program progress to its final stages, when Western knowledge about how far Iran has progressed will be problematic. Indeed, Prime Minister Netanyahu made this very point during his UN address. He noted that the Iranian enrichment facilities containing thousands of spinning centrifuges were “very big industrial plants.” That meant they were both visible and vulnerable. However, he added that once the Iranian weapons program has moved on to the next stage involving the production of a nuclear detonator, then it would no longer be reliant on large plants but rather could be completed in a small workshop that is the size of a classroom. At the very final phase of Iran’s nuclear activity, it would be far less visible to Western surveillance and hence it would be far less vulnerable.

It is for this reason that Israel has had to draw its red line on Iran’s drive for nuclear weapons on the enrichment phase of the program and not wait for the weaponization phase which would be too late. In summary, it is difficult to say with precision when Iran will acquire enough 20 percent uranium that can be enriched further to the weapons-grade level for the manufacture of an atomic bomb. But what is clear is that this moment in time is fast coming close and Iran must be halted well before it arrives. In the meantime, according to the latest IAEA report, Iran has substantially increased the number of centrifuges that it installed for uranium enrichment. It also introduced its more advanced centrifuges into its nuclear facilities and it is making progress on its heavy water reactor that will allow it to produce plutonium.20

In the present negotiations between the P5+1 and Iran, the West will undoubtedly be cognizant of Israel’s focus on uranium enrichment to the 20 percent level and the red line drawn by Prime Minister Netanyahu. Iran, so far, has been careful not to cross the Israeli red line, but that hasn’t prevented it from moving ahead on other aspects of its program. Indeed, just after the last P-5 plus 1 talks in Kazakhstan, Tehran announced it was building 3,000 advanced centrifuges that it intended to install at Natanz. Thus, if proposals are to be made that protect the international community as a whole from the threat of Iranian nuclear weapons, they must address other aspects of the program that were discussed here and which might become fully operational in the years to come: the plutonium program, weaponization, delivery vehicles, and continuing upgrade of Iran’s centrifuge technology. If negotiations only halt one aspect of the Iranian effort to reach nuclear weapons, while letting the other parts of the program go forward, they may preclude an immediate crisis, but the world will still face a new Iranian challenge in the years ahead.

**Notes**

This article is based on a briefing paper prepared for a meeting with the Program on Negotiation at Harvard Law School and the Middle East Initiative at the Harvard Kennedy School on March 4, 2013.

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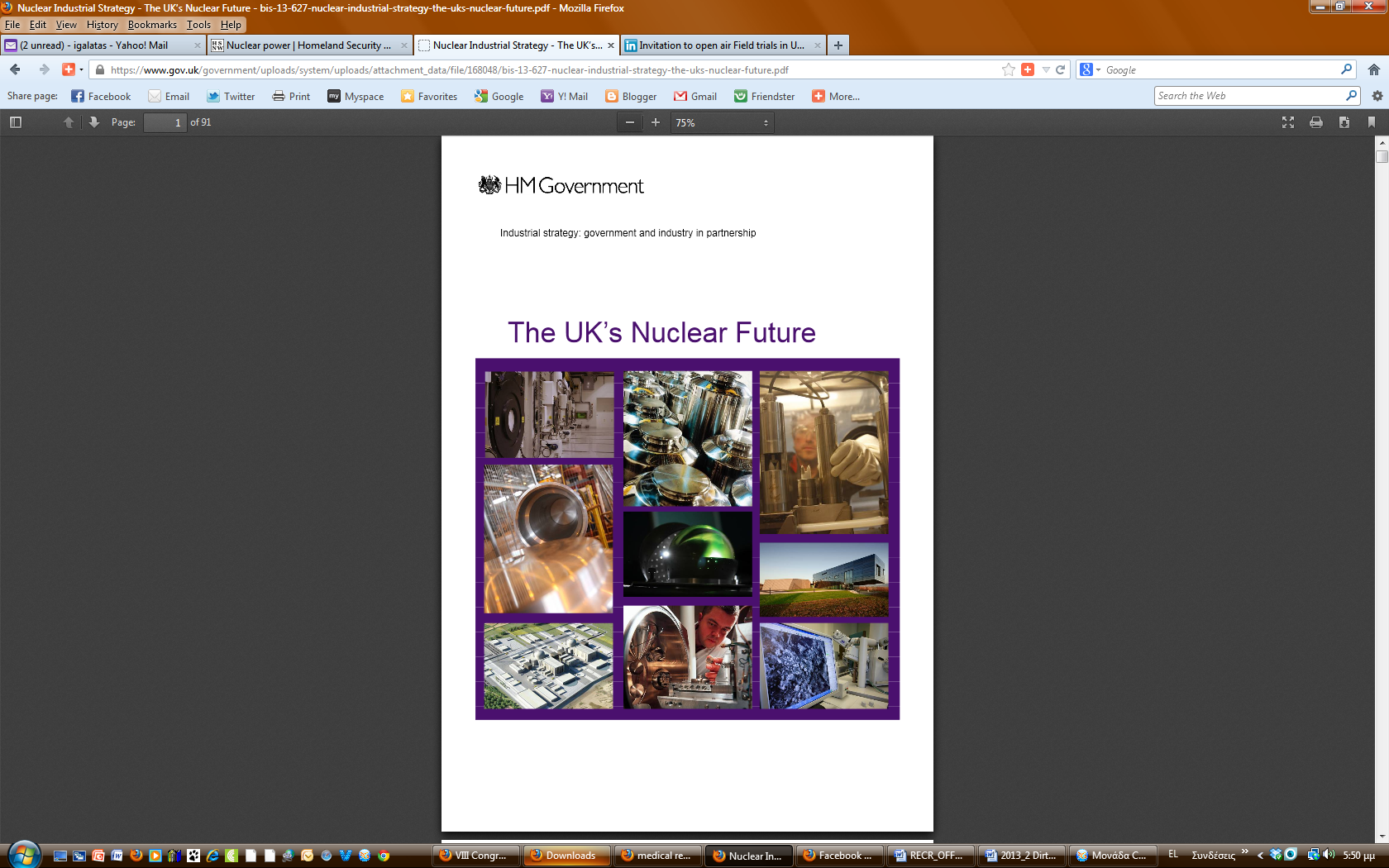
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## U.K. outlines its long-term nuclear future

Source: http://www.homelandsecuritynewswire.com/dr20130327-u-k-outlines-its-longterm-nuclear-future

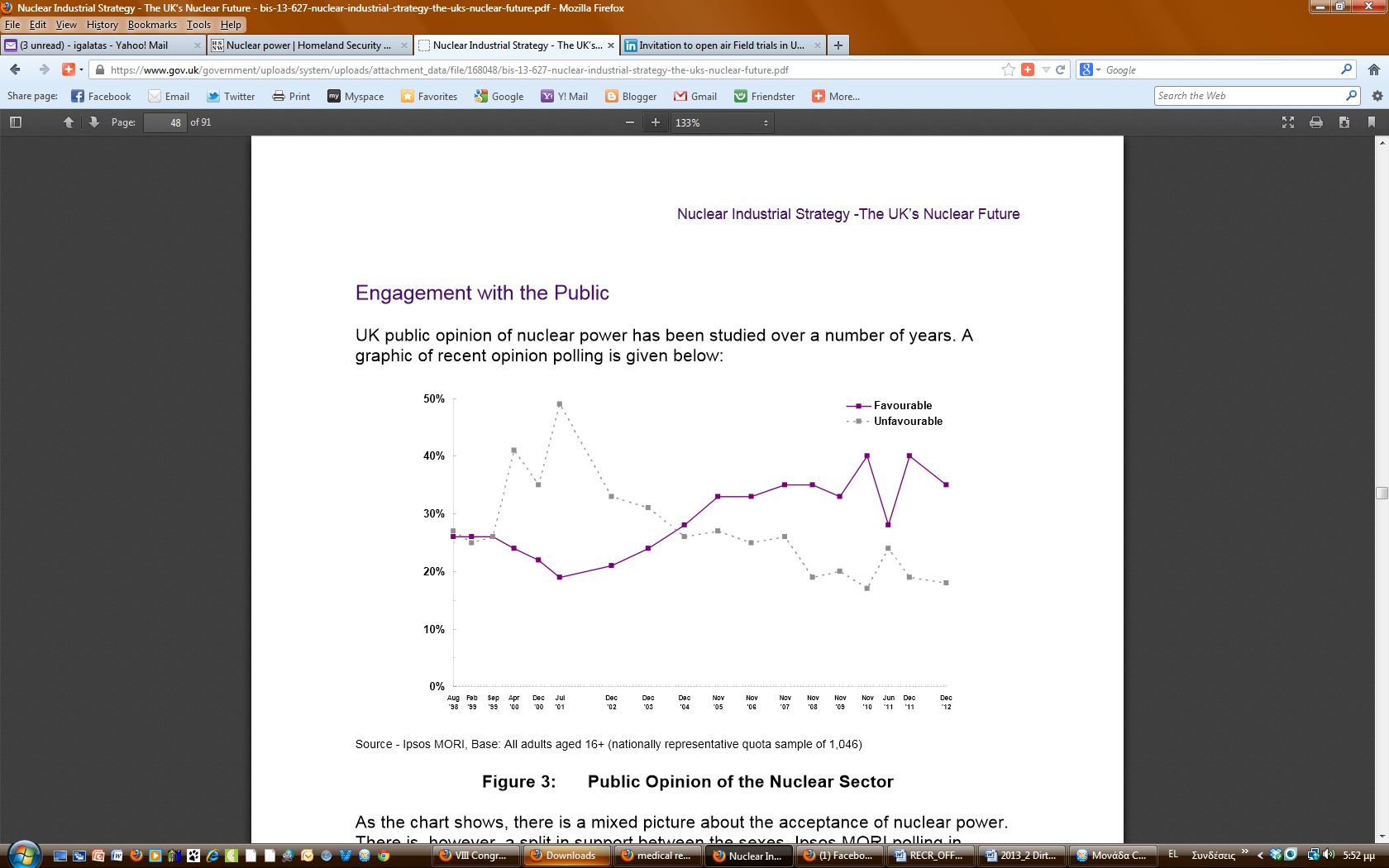
Over the next two decades it is forecast that, globally, there will be £930 billion investment in building new reactors and £250 billion in decommissioning those that are coming off line. The nuclear new build program in the United Kingdom alone could generate up to 40,000 jobs in the sector at its peak. Government publishes industrial strategy to enable the UK to seize the opportunities for economic growth in the nuclear industry.

An industrial strategy, developed by the U.K. government and industry, has been published yesterday (March 26), aiming to allow the United Kingdom to exploit the opportunities for economic growth in the nuclear industry. It covers the whole of the nuclear market — new build, waste management and decommissioning, fuel cycle services, operations, and maintenance.

Business Secretary Vince Cable noted that this follows the launch of the aerospace strategy last week and is the next step in the government’s industrial strategy. A plan for oil and gas will be published later this week, with strategies for all eleven key sectors being completed in the coming months to secure sustainable future growth in the economy.

Over the next two decades it is forecast that, globally, there will be £930 billion investment in building new reactors and £250 billion in decommissioning those that are coming off line. The nuclear new build program in the United Kingdom alone could generate up to 40,000 jobs in the sector at its peak. The government says that the nuclear industrial strategy sets out the basis for a long-term partnership between government and industry to exploit those opportunities.

The strategy is being overseen by a Nuclear Industry Council, co-chaired by ministers and industry. It includes a range of commitments, including:

* £15 million for a new world class National Nuclear Users Facility for universities and companies carrying out research into nuclear technology. The facility will have centers at the National Nuclear Laboratory at Sellafield, the Culham Center for Fusion Energy in Oxfordshire and the University of Manchester’s Dalton Cumbrian Facility.
* Thirty-five nuclear research and development projects have won £18 million worth of support from a Technology Strategy Board competition, which will leverage in a further £13 million of private sector investment. This includes OC Robotics in Bristol who have received almost £6 million to develop their LaserSnake technology — a robot controlled laser cutting tool that can be used as part of nuclear decommissioning projects.
* £12.5 million to join the Jules Horowitz Test Reactor program which is being constructed in France. The reactor will provide the United Kingdom with a valuable radiation testing facility to develop future advance nuclear fuels.
* The government spent £66 million in 2011 on nuclear research and development and will keep under review its level of future expenditure. It is keen to explore opportunities to back future reactor designs, including the feasibility of launching a Small Modular Reactor (SMR) R&D program to ensure that the United Kingdom is a key partner of any new reactor design for the global market.
* Government is making some changes to the role and organization of the National Nuclear Laboratory (NNL) so that it plays a more central role in advising government on nuclear matters and in strategic research projects.
* Nuclear new build in the United Kingdom is forecast to generate up to 40,000 jobs in the sector at its peak, but employers are currently reporting skills shortages — particularly in engineering. Tackling the skills gaps will be one of the actions to be taken forward through a focused Skills Delivery Plan led by the Nuclear Energy Skills Alliance.
* UKTI will develop a strategy aimed at attracting inward investment as well as promoting export opportunities.

The government says that the results of a major review into research and development capability in the United Kingdom have also been published yesterday. The review has helped to shape the industrial strategy and was carried out by government, industry, and academia, assisted by an Advisory Board chaired by Sir John Beddington, the government’s Chief Scientific Advisor. It was instigated in response to a House of Lords inquiry.

The Board’s recommendations recognize that nuclear power will continue to play an important role in the United Kingdom to 2050 and beyond and that a range of technologies may be required to meet the challenges of an expanded demand for nuclear power. Therefore, the Board recommended concrete action in a number of areas to ensure that technological options for nuclear power generation are kept open in the future. The industrial strategy forms a major part of the government’s response to these recommendations.

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**By Ali Vaez, Karim Sadjadpour**

Source: http://www.carnegieendowment.org/2013/04/02/iran-s-nuclear-odyssey-costs-and-risks/fvui#

**Summary**

The covert history of Iran’s nuclear program is marked by enormous financial costs, unpredictable risks, and unclear motivations.

Iran’s half-century nuclear odyssey has been marked by enormous financial costs, unpredictable risks, and unclear motivations. The program’s covert history, coupled with the Iranian government’s prohibition of open media coverage of the nuclear issue, has prevented a much-needed internal debate about its cost-benefit rationale. Critical questions about the program’s economic efficacy and safety have been left unanswered.

#### On the Ground: Costs and Risks

* The program’s cost—measured in lost foreign investment and oil revenue—has been well over $100 billion.
* The Bushehr nuclear reactor took nearly four decades to complete and cost almost $11 billion (measured in today’s dollars), making it one of the most expensive reactors in the world.
* Bushehr provides merely 2 percent of Iran’s electricity needs, while 15 percent of the country’s generated electricity is lost through old and ill-maintained transmission lines.
* Despite aspirations to be self-sufficient, Iran’s relatively small uranium resources will inhibit the country from having an indigenous nuclear energy program.
* Iran is the only nuclear state that is not a signatory to the Convention on Nuclear Safety, and its nuclear materials and stockpiles are some of the least secure in the world.
* Most ominously, the Bushehr reactor sits at the intersection of three tectonic plates.

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## White House Advances Controversial Nuclear Incident Response Guide

**By Douglas P. Guarino** (Global Security Newswire)

Source: http://www.nextgov.com/defense/2013/04/white-house-advances-controversial-nuclear-incident-response-guide/62243/

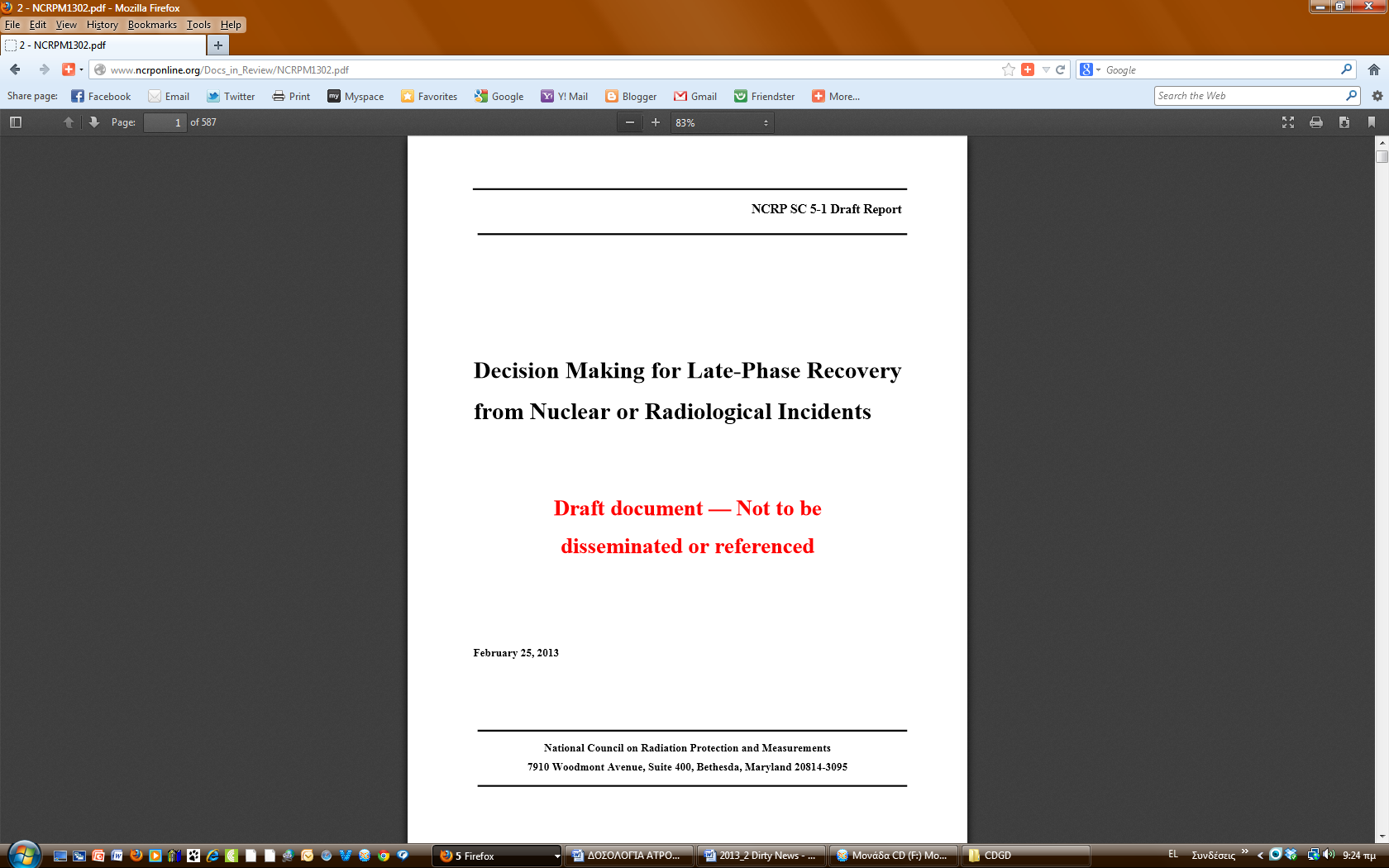
The White House has cleared the way for a controversial guide on responding to nuclear incidents that is expected to relax long-held cleanup standards, prompting watchdog groups to call for Senate scrutiny of the matter during hearings on Gina McCarthy's nomination to become the next Environmental Protection Agency administrator.

The White House Management and Budget Office completed its review of the Environmental Protection Agency’s protective action guidance for radiological incidents on Friday, according to the OMB website. While the document is not yet public, it is widely expected to suggest cleanups do not have to comply with public health guidelines established during the 1980s by the EPA Superfund program.

One of the Obama administration’s first actions upon taking office in January 2009 was to halt publication of a Bush-era draft of the document.

The earlier version suggested people could drink water contaminated with radiation levels thousands of times above what the Environmental Protection Agency would normally allow following an incident such as a radiological “dirty bomb” attack or a nuclear power plant accident. It also embraced a loosely defined approach to cleanup called “optimization,” under which stakeholders would be permitted to develop unique remediation standards for a given incident rather than follow Superfund rules.

The Obama White House now backs optimization, according to a recently completed draft report sponsored by the Homeland Security Department. This has alarmed nuclear watchdogs, particularly since the report suggests optimization would permit annual radiation doses that could cause as many as one in about 20 people to develop cancer over a 30-year period. In a worst-case scenario, EPA rules do not typically allow a cancer risk greater than one in 10,000 during this time frame.

Given the findings of the DHS report, nuclear watchdogs say they expect the EPA guide will suggest that following its own Superfund rules is not necessary in all cases. A version of the EPA guide floated internally during President Obama’s first term included such language, and activists say the findings of the DHS report show the White House approves such statements.

Activists would have preferred that the EPA guide continue to languish in a state of perpetual review, but now that it has been cleared by the White House they are pushing the Senate to scrutinize the issue when it considers Gina McCarthy’s nomination to become the agency’s next administrator. McCarthy, who as assistant administrator for air and radiation was responsible for overseeing revisions of the guide, is due to appear before the Senate Environment and Public Works Committee on April 11.

“The responsibility is shared between the EPA officials who did not stand up for strong environmental protection and the White House which has been eager to show its tilt toward industry when it comes to environmental protection,” said Daniel Hirsch, president of Committee to Bridge the Gap, which led some 60 public interest groups against the Bush-era version of the guide in 2008.

A spokeswoman for Senate Environment and Public Works Committee Chairwoman Barbara Boxer (D-Calif.) did not respond to a request for comment. White House and EPA officials also did not respond to requests for comment by press time.

Activists, meanwhile, are calling for the private National Council on Radiation Protection, which organized the drafting of the report on optimization on behalf of the Homeland Security Department, to extend its public comment period for the document. The present deadline is Thursday, but activists are asking that it be pushed back 60 days after learning of it from reports in Global Security Newswire.

“It has just come to our attention that this extensive and potentially highly influential NCRP document is available for public review and comment,” 16 watchdog groups, including Physicians for Social Responsibility, Friends of the Earth and the Nuclear Information and Resource Service, said in a Monday letter. “It is clearly intended to serve as an influential recommendation that will affect the regulations that protect the public from ionizing radiation. To our knowledge, the public and public interest groups have not been included in the development of this document despite many of us actively interacting for decades in the issues it covers.”

Activists have previously raised concerns about the makeup of the panel that drafted the report. While the document discusses the Superfund cleanup approach extensively, no experts from the EPA office that works on the program directly were included on the panel. Instead, representatives of the agency’s radiation and emergency management offices – which have routinely argued against the Superfund approach – were selected to participate as consultants or advisers.

The draft report argues that the 2011 Fukushima disaster in Japan demonstrated that abandoning normal EPA standards is necessary in some cases. The DHS report says the disaster contaminated an area the size of Connecticut and, it claims, showed that cleaning up as thoroughly as the U.S. government usually requires would not be possible.

Activists have challenged this argument, noting that many dirty bomb scenarios the DHS report and the pending EPA guide address would affect areas substantially smaller than those traditional Environmental Protection Agency standards have been applied to in the past. The normal EPA benchmarks have been used at hundreds of sites, including nuclear weapons facilities owned by the Energy Department, mining grounds stretching across hundreds of square miles and the urban areas affected by the 2001 attacks on New York and Washington.

A major concern of not only activists, but also some EPA and state government officials, is the precedent a federal document allowing for relaxed remediation standards in a wide range of radiological scenarios could set for routine cleanups. Private companies and government officials are already arguing against using the Superfund approach at several radiological sites, including the Santa Susana Field Laboratory in California and an area of in central Florida where EPA officials fear some 40,000 people living on former phosphate mines may be exposed to dangerous levels of radiation.

# ►Read the draft report at: http://www.ncrponline.org/Docs\_in\_Review/NCRPM1302.pdf

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