



April 11, 2011

Technical Note: Revisiting Bomb Reactors in Burma and an Alleged Burmese Nuclear Weapons Program

By David Albright and Christina Walrond

Introduction

The debate over Burma's nuclear ambitions continues. At ISIS, we have assessed that Burma's military regime is a nuclear wannabe. It wants to develop nuclear technologies despite having little apparent civilian requirement for such capabilities. However, sparse information, limited international inspection mechanisms, and regime opacity limit the ability to assess allegations of secret nuclear activities in Burma. The key question remains whether North Korea has sold or will sell Burma's military regime equipment for a nuclear reactor or a gas centrifuge plant or otherwise will help the regime's nuclear effort.

The Burmese opposition groups and experts affiliated with these groups dominate the development of new information and allegations of covert nuclear weapons programs. But like information from any group opposed to a regime, their information and assessments should be approached critically. In the case of Iran, and earlier, Iraq, opposition groups' nuclear claims have had a mixed record at best. In addition to the poor quality of much of their information, too often their assessments are biased. Moreover, experts independent of these groups rarely review such assessments prior to publication.

In the debate about Iran's nuclear capabilities, assessments by the International Atomic Energy Agency (IAEA) and a variety of governments have served to create a more accurate and balanced debate. However, governments and the IAEA have so far shown little willingness to weigh in publicly on the allegations about alleged Burmese nuclear activities.

Because Burma's declared nuclear activities are small, these activities are exempt from compulsory IAEA inspections.¹ Moreover, the regime largely ignored IAEA letters sent in mid-2010 asking for additional information and clarification about reports of nuclear development, and the IAEA had little recourse. Nonetheless, the IAEA sent a letter late last year, as [first reported by the *Wall Street Journal*](#) and confirmed by ISIS, asking Burma to visit multiple sites related to [information obtained](#) by the exile new agency, the Democratic Voice of Burma (DVB).² Thus far, the Burmese regime has not responded to the IAEA's request.

¹ In 1995, Burma signed a Small Quantities Protocol (SQP), which holds certain reporting responsibilities in abeyance. Under this protocol, Burma can produce yellowcake, but it is not obligated to report its production unless the yellowcake is exported to a non-nuclear weapon state or if it purifies the yellowcake to nuclear-grade. The SQP permits Burma to hold up to one effective kilogram of nuclear material without reporting it to the IAEA, but if Burma purifies this material to nuclear-grade, regardless of the amount, it must tell the IAEA about the facility which purified this material.

² Jay Soloman, "[Myanmar's link with Pyongyang stir nuclear fears,](#)" *The Wall Street Journal*, December 17, 2010.

Without an increase in the military regime's willingness to cooperate, Burmese opposition groups will likely remain a main source of new information and assessments about Burma's nuclear ambitions. ISIS believes that their information deserves serious and on-going consideration, despite the frequent finding that it lacks merit. ISIS also believes that a robust debate can over time improve the quality of both the information and the assessments. In this report, ISIS returns to a key finding in a report issued by the Democratic Voice of Burma in May 2010 that has attracted controversy.

Purpose of Bomb Reactors

In May 2010, Robert Kelley and Ali Fowle authored a report, [Nuclear Related Activities in Burma](#), published by the DVB. The report evaluates the purpose of equipment seen in a set of photographs and other information provided by a defector, a former Burmese army major named Sai Thein Win. The report finds that "analysis leads to only one conclusion: this technology is only for nuclear weapons and not civilian use or nuclear power." It continues, "[This information] is consistent with a program to make UF₆ (uranium hexafluoride) for enrichment by MLIS (molecular laser isotope separation) or centrifuge and uranium metal for a possible bomb core." Because Win did not attest to the existence of a nuclear weapons program in Burma, the technical evaluation of these pictures is at the core of the authors' conclusions. However, other experts queried by ISIS have differed with the authors in their interpretation of the purpose of the equipment in these photographs.

One example of this disagreement concerns the authors' interpretation of one particular piece of equipment shown in photos and documents that represents a key part of the authors' certainty of the existence of a Burmese nuclear weapons program. The pictures are of reduction vessels taken by Win, and the documents show a schematic of a reduction vessel (see figures 1 and 2). Also known as "bomb reactors," these vessels are used to contain violent chemical reactions. While they can contain the reaction of uranium tetrafluoride and magnesium or calcium, bomb reactors are also widely used to make other metals.

An industry expert with decades of expertise in metal production, including the Ames process that dates to the Manhattan Project, stated to ISIS that the vessels in the photographs would generally be used to contain a calciothermic process to make metals that would melt at temperatures below 1,500 degrees centigrade. Although the vessels would be suitable for the production of uranium metal, they could also be used to produce rare earth metals or metals such as titanium or vanadium. Based on the pictures and schematic of the bomb reactor (figures 1 and 2), this expert assessed that it would be impossible to tell whether the vessels are more likely to be used to produce uranium or another metal. He estimated that kilogram quantities of metal could be produced in this reactor; the authors of the DVB report estimated 20-25 kilograms.

The DVB report indicates that the use of bomb reactors outside the scope of a nuclear program is "relatively rare." The industry expert, however, has many years of experience in creating metals other than uranium using this type of technology. In fact, the production of kilogram quantities of rare earth metals using the calciothermic reduction process has a long history in civilian research and industry.³ Rare earth metals have many civilian applications. Burma has substantial rare-earth deposits.⁴ This past December, Burma signed an agreement with South Korea to develop this resource.⁵

One possibility not considered by the authors of the report is that the bomb reactors could be part of a research and development program to make rare earth metals useful for military, nuclear, or civilian uses. For

³ For example, see U.S. patent no. 3,014,797 (INSERT LINK) shows a vessel that is similar to the vessels shown in the photographs provided by the Burmese defector. The description of the device indicates that it is used to prepare pure rare earth metals and metals such as titanium, zirconium, and hafnium. Although the figures in this patent show a vessel that has similarities to the vessel in the DVB photos, this ISIS report does not assess these similarities.

⁴ Often, rare earth deposits contain uranium. The production of high purity rare earths requires the removal of any impurities—including uranium. In processing rare earths, Burma can also separate uranium as a byproduct.

⁵ Ian Mackinnon, "South Korea makes rare call on Burma," *The Age*, December 30, 2010.

example, according to the expert, these vessels would be suitable for the production of cobalt-samarium metal. This metal can be used to create powerful magnets for a wide variety of civil and military purposes. They can also be used in missile or gas centrifuge programs. Research and development of cobalt-samarium metal could be consistent with Burma's actual or attempted procurement with North Korea's assistance of dual-use equipment useful in making precision magnets.⁶ Such a possibility heightens concerns that Burma may receive foreign assistance if it pursued nuclear weapons. With a track record of nuclear proliferation, North Korea is a likely candidate to help Burma seek the wherewithal to make nuclear weapons. However, this analysis does not lead to a definite conclusion about the existence of either a program to make cobalt samarium magnets, a gas centrifuge program, or a nuclear weapons program.

To justify their assessment, the authors of the DVB report also rely on Win's information that the bomb reactors were to be used in the "special substance production research department." However, the defector did not identify the "special substance." The authors speculated that it is uranium, perhaps even highly enriched uranium (HEU). However, given the vast number of different types of metals that these vessels could produce, "special" is a highly subjective term. Determining what the military regime might call a "special substance" in a country known for intense secrecy is difficult at best.

HEU Metal?

The DVB report implies that the vessels could be used to create HEU metal.⁷ This claim appears to be based largely on the relatively small size of the vessel, a poor indicator of its use. This conclusion alludes that Burma has HEU or is planning to produce some in a domestic enrichment plant. Yet Win offers no such information, and reports of such capabilities are based on the testimony of other defectors whose credibility has been widely challenged by experts and government officials. As mentioned above, these vessels could be used for natural uranium metal production. A nuclear weapon could use natural uranium metal as a tamper, but this is still not a compelling indicator of the existence of a nuclear weapons program. These vessels themselves do not indicate that Burma is pursuing any kind of uranium enrichment, much less working on a nuclear weapons program.

It is difficult to see how all this uncertain information could lead to the conclusion that Burma is developing nuclear weapons. While it could be a possibility, based on the evidence other outcomes are also possible. The claim that a country is pursuing a nuclear weapons program should not be made lightly or without significant evidence. A lesson of the Iraqi weapons of mass destruction (WMD) fiasco is that defectors purveyed by groups opposing a regime should be vetted thoroughly, and their claims about nuclear weapons programs need strong confirmation. The DVB has not provided thorough vetting or confirmation in this case.

Other Possibilities to Consider

For several years, Burma has pursued uranium mining on at least a small scale. It would be logical that Burma would seek a capability to mill and possibly further process uranium. Burma's interest in buying a safeguarded research reactor from Russia is also well documented. In its statement to the IAEA General Conference in September 2009, Burma indicated that such "a research reactor with experimental facilities would be an indispensable tool for education and training, research and other peaceful applications in nuclear science and

⁶ David Albright, Paul Brannan, Robert Kelley, and Andrea Scheel Stricker, [Burma: A Nuclear Wannabe; Suspicious Links to North Korea; High-Tech Procurements and Enigmatic Facilities](#), ISIS Report, January 28, 2010.

⁷ "This is consistent with a program to make ... uranium metal for a possible bomb core," Robert Kelley and Ali Fowle, *Nuclear Related Activities in Burma*, May 2010.

technology.”⁸ The small Burmese nuclear establishment could be researching uranium mining, milling, and conversion capabilities as part of its interest in this reactor. In fact, its interest in processing uranium would more likely correspond with nuclear reactor technology than with a nuclear weapons program. This is further supported by Win’s statement to the DVB report authors that at the location of the same organization that ordered the bomb reactor, Win also saw a crude system to drive a control rod for a reactor. If the bomb reactor is intended for processing natural uranium into metal, this interest may also be a spillover from Burma’s interest in a Russian-supplied reactor. The schematic of the bomb reactor has no specifications; it looks as though it were reverse-engineered, implying a rather rudimentary effort, which Kelley and Fowle point out about the entire effort. One can legitimately interpret this schematic and the bomb reactor as part of a halfhearted effort to better understand uranium processing.

Even if Burma is pursuing these activities, this does not represent evidence of a nuclear weapons program. Without further information, which is currently lacking, it is impossible to determine conclusively that the bomb reactors depicted in the defector’s photos are part of any nuclear program.

Increasing Transparency

While the information provided by Win does not translate to Burma having a nuclear weapons program, his information does raise an important issue: how can the international community evaluate these and other claims of covert nuclear activities in Burma? Concern that North Korea could secretly sell the regime a nuclear reactor or gas centrifuges only increases the urgency of sorting rumors from fact.

The IAEA is the appropriate international authority to investigate these concerns. The IAEA should continue pressing the regime for more answers and access to suspicious sites. The IAEA’s efforts to convince the military regime to agree to more effective safeguards arrangements are also critical. If Burma continues to refuse IAEA requests for more transparency, the Board of Governors should consider this issue and take appropriate action.

The United States intelligence community should declassify key findings of its intelligence assessments about Burma’s nuclear activities. One way to do that is for the intelligence community to report its findings to Congress, as it does for several other countries of concern. Likewise, other countries focused on Burma’s nuclear activities, such as Germany and Japan, should publicly report on their own views of alleged nuclear activities.

Another approach focuses on United Nations Security Council resolutions aimed at North Korea. A priority is to ensure that Burma does not engage in banned cooperation with North Korea. Toward this end, information about alleged Burmese/North Korean cooperation should be forwarded to the Security Council and its expert panel charged with overseeing resolutions on North Korea.

Although the IAEA and governments should continue to press the Burmese regime for more transparency, this stalemate calls for more rigorous assessments by outside experts and non-governmental organizations in determining the actual nuclear situation in Burma. Burmese opposition groups, including DVB, have obtained important information about the regime’s secret and repressive activities. Win provided important confirmatory and inside information about two long suspected military factories outfitted by the regime’s illicit procurements.⁹ Win’s photos were taken inside of these buildings. However, regime opposition groups often utilize unconfirmed nuclear allegations to increase international pressure on the regime. Burmese opposition

⁸ [“Statement by the Leader of Myanmar Delegation H.E. U Tin Win to the 53rd Annual Regular Session of the IAEA General Conference,” September 14-18, 2009.](#)

⁹ [Burma: A Nuclear Wannabe; Suspicious Links to North Korea; High-Tech Procurements and Enigmatic Facilities](#), ISIS Report, op. cit.

groups are largely no different, and their results are not surprising. Thus far, defector claims of secret Burmese nuclear facilities or nuclear weapons programs have been debunked or are unconfirmed.

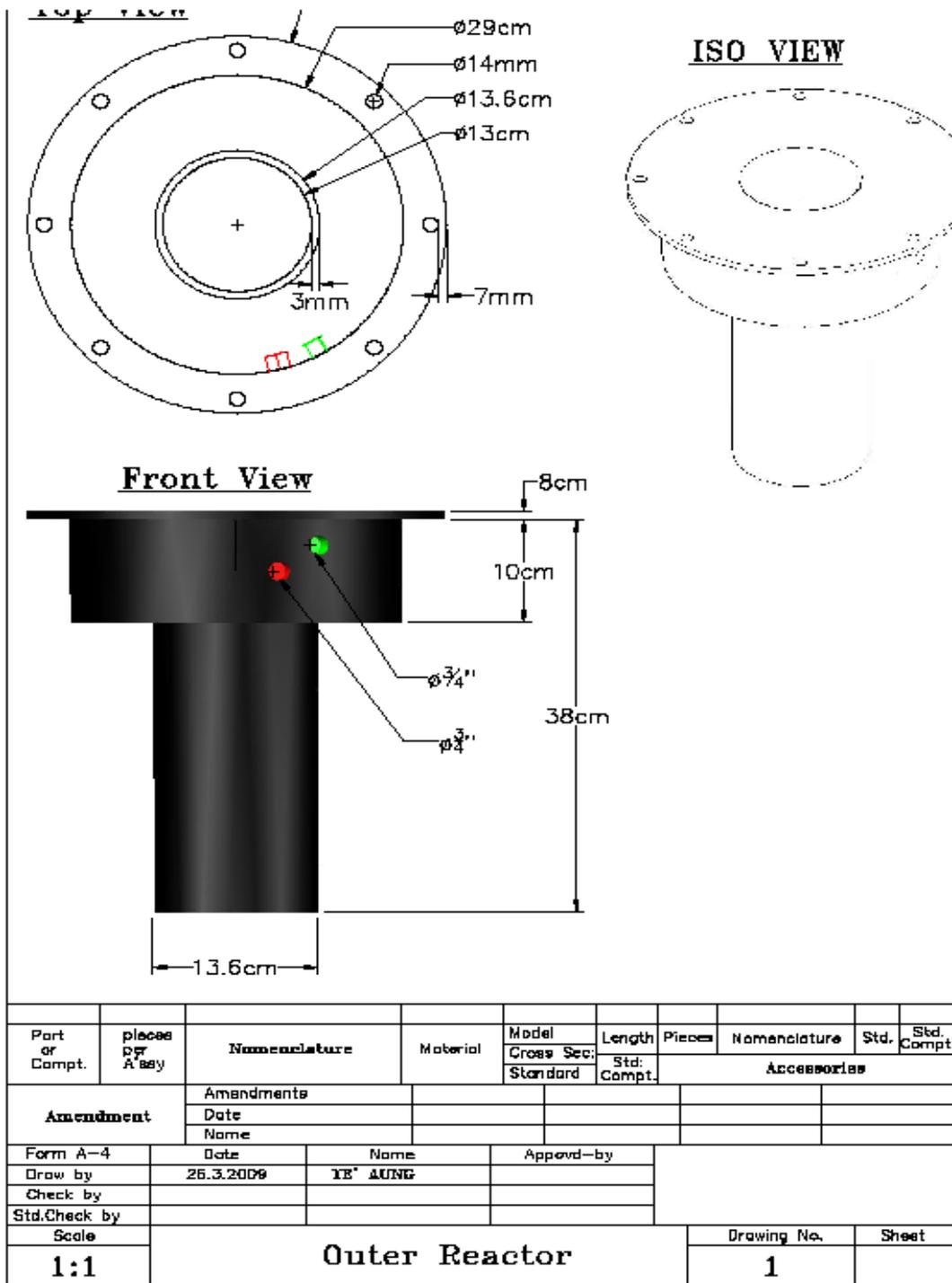
Enough suspicions remain about the Burmese regime's ambitions that more scrutiny is needed. This scrutiny needs careful balancing and a thorough review. Otherwise, important information risks being discarded or devalued, diverting necessary and sustained attention that the nuclear intentions of the Burmese regime deserve.

Figure 1: Bomb Reactors



Source: DVB

Figure 2: Schematic for Bomb Reactor



Source: DVB