



Background Information on the Exploding Bridge Wire Issue: A Crack in the Door?

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On February 8 and 9, 2014, the International Atomic Energy (IAEA) and Iran held constructive technical meetings within the Framework for Cooperation that was agreed between the parties in November 2013. Iran and the IAEA reached agreement on seven practical measures to be implemented by Iran by May 15, 2014, including one provision:

- Providing information and explanations for the IAEA to assess Iran's stated need or application for the development of Exploding Bridge Wire (EBW) detonators. These EBW detonators are also called Electrical Bridge Wire detonators.

In April 2008 ISIS posted on its website a [document](#) summarizing a February 25, 2008 technical briefing given in Vienna by Olli Heinonen, then the IAEA's Deputy Director General of Safeguards, to member states, including Iran. The briefing highlighted several technical issues related to the IAEA's outstanding questions about the scope and direction of Iran's alleged nuclear weaponization program prior to 2004. The briefing included the issue of the EBW detonators and the questions that Iran needed to clarify at that time. Iran and the IAEA had subsequent discussions in 2008 but they were unable to settle this issue, partially because of Iran's abrupt cancellation of scheduled meetings and visits in September 2008.

The development of safe, fast-acting detonators, such as EBWs, and equipment suitable for firing the detonators, is an integral part of a program to develop an implosion type nuclear device. Thus, the IAEA was concerned about Iran's alleged work on EBW detonators in the context of firing systems, or multipoint initiation systems, that Iran was reportedly using in nuclear weapons development and testing prior to 2004. The IAEA's concerns were increased by information that Iran developed and tested a remote firing system, which would have involved EBWs, that appears connected to developing a capability to detonate a nuclear device underground from a site ten kilometers away.

Reprint of Notes from a February 2008 Technical Briefing on EBW and Associated Activities

Below is reprinted the technical discussion from the *Briefing notes from February 2008 IAEA meeting regarding Iran's nuclear program: Section 3. Tests of high power explosives:*

"Reminder of outstanding questions: several types of experiments must be clarified:

- the development and manufacture of high tension EBW (Electrical Bridge Wire) detonators;
- design and fabrication of firing devices tested under simultaneous conditions, synchronized at 130 nanoseconds.

- development and testing of a remote firing system (10 km) and a similar system for firing in a well 400 meters deep.

Regarding this last point, Mr. Heinonen showed a diagram in principle, presumed to be of Iranian origin, on which there is a space for measuring instruments.

Iran's statements reported by Mr. Heinonen:

- These allegations are groundless;
- Iran has developed the EBW as a safe and reliable alternative to spark gap detonators and has produced them for conventional uses.
- Iran has acknowledged carrying out tests for the simultaneous detonation of two or three systems but with far less precise temporal synchronization than that cited by Olli Heinonen and indicated in the documents (130 nanoseconds). Iran has refused to show the sites of these conventional tests.
- Iran has provided open publications on the firing of spherical and hemispherical systems but did not want to provide additional information on its experiments.

Agency [IAEA] Evaluation:

- The high-tension firing systems and multiple EBW detonators fired simultaneously are key components of nuclear weapons.
- There are a limited number of non-nuclear applications (high performance technique for exploratory drilling).
- The elements available to the Agency are not consistent with any application other than the development of a nuclear weapon.
- The Agency does not have sufficient information at this stage to conclude whether the allegations are groundless or the data fabricated.

Mr. Heinonen said during the briefing that the Agency had used documents from three sources:

- its own information,
- documents relating to procurement,
- and information from several member states."

Subsequent Actions

Many discussions between Iran and the IAEA on the EBWs occurred after February 2008 up until September 2008, as reflected in the safeguards reports prepared for the IAEA Board meetings in June and September 2008. Iran provided additional documentation and some answers, but the Iranians did not assuage the concerns of the IAEA. The IAEA did develop a good understanding of those points Iran acknowledged. A gap in the IAEA's understanding remained with regard to the use of EBWs in firing systems, or multipoint initiation systems, used in two nuclear weapons designs that Iran was reportedly developing, based on additional information in the hands of the IAEA. The first nuclear weapon design, an older one, used about 64 detonation points, requiring 64 EBWs. The other smaller, more advanced weapon design required only two EBWs. The IAEA and Iran planned to discuss their differences further at a meeting in September 2008 that was intended to discuss high explosive issues, including the EBWs. The IAEA was also slated to visit workshops associated with the manufacture of a mock-up of a re-entry vehicle for a ballistic missile that is suspected to have been designed to hold a nuclear warhead. The workshops were located near the old international airport in Tehran. At the last minute, however, senior Iranian leaders decided to reverse course and cancel the meetings and visits. At this point the discussions came to a halt.

Although Iran has not committed in this recent agreement with the IAEA to discuss all the major outstanding issues surrounding its alleged military nuclear programs, it has now committed to provide information and explanations to enable the IAEA to assess its stated need or application for the development of EBWs. That assessment will necessarily involve the IAEA drawing on its information suggesting that Iran was developing and testing EBWs as part of firing systems for use in nuclear implosion devices. In addition, the IAEA may seek to interview key participants of this effort and the leaders of the overall program in order to conduct its assessment. It may renew its requests to interview Mohsen Fakhrizadeh, alleged to have been the head of Iran's nuclear weapons effort.

The prospects for a comprehensive solution under the Joint Plan of Action are likely remote as long as Iran does not address the IAEA's concerns about past and possibly on-going work on nuclear weapons. Iran now has a new opportunity to do so. It should seize this opportunity, because few believe that Iran did not have a nuclear weapons program, at least until 2004. The unclassified 2007 U.S. National Intelligence Assessment on Iran, concluded: "We assess with high confidence that until fall 2003, Iranian military entities were working under government direction to develop nuclear weapons."¹ Britain, France, and Germany concurred. Admitting to past work on nuclear weapons is a major step for Iran but one that must come before any significant removal of economic sanctions.

¹ Office of the Director of National Intelligence, National Intelligence Assessment, *Iran: Nuclear Intentions and Capabilities*, Washington, DC, November 2007.