



Nuclear Weapons R&D Organizations in Nine Nations

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Summary

Seven nations—China, France, India, Pakistan, Russia, the United Kingdom, and the United States—possess nuclear weapons. In addition, North Korea tested a nuclear explosive device in 2006 and announced that it had conducted another such test in 2009, and Israel is widely thought to have nuclear weapons. As an aid to Congress in understanding nuclear weapons, nuclear proliferation, and arms control matters, this report describes which agency is responsible for research and development (R&D) of nuclear weapons (i.e., nuclear explosive devices, as distinct from the bombers and missiles that deliver them) in these nations and whether these agencies are civilian or military. It also traces the history of such agencies in the United States from 1942 to the present. This report will be updated annually, or more often as developments warrant.

In the United States, the Army managed the nuclear weapons program during World War II. Since 1946, weapons R&D has been managed by civilian agencies, at present by the National Nuclear Security Administration, a semiautonomous agency in the Department of Energy.

China's nuclear weapons R&D is apparently under the direction of the military, collectively called the People's Liberation Army.

France's nuclear weapons R&D is supervised by the Ministry of Defense, which delegates the direction of these programs to the French Atomic and Alternative Energy Commission (CEA). However, as with NNSA in the United States, CEA is not a part of the Ministry of Defense. CEA also conducts nuclear programs in science and industry, under the supervision of other ministries.

India's nuclear weapons R&D appears to be controlled by the Department of Atomic Energy, which is under the direct control of the Prime Minister.

Israel's nuclear program is under civilian control, but since Israel neither confirms nor denies that it possesses nuclear weapons, it classifies information on nuclear weapons, including organizations responsible for R&D. The Israel Atomic Energy Commission reportedly has overall responsibility for Israel's nuclear weapons program, and the Director General of that commission reports directly to the Prime Minister.

North Korea's Ministry of Atomic Energy Industry is in charge of the day-to-day operation of the nuclear weapons program. Under it are nuclear-related organizations. Policy is decided by leader Kim Jong-il and other Communist Party and military leaders who advise him.

Pakistan's National Command Authority (NCA) supervises the functions and administration of all of Pakistan's "Strategic Organizations," which are composed of all organizations involved in nuclear weapons. The Prime Minister is the chair of the NCA, and the membership includes senior civilian and military leaders.

Russia's State Atomic Energy Corporation (Rosatom) is responsible for nuclear weapons R&D and production. It is a civilian agency, though it has many links to the military.

In the United Kingdom, a private company, AWE Management Limited, manages and operates the Atomic Weapons Establishment (AWE), a government-owned, contractor-operated entity. The Ministry of Defence (MoD), which is headed by a civilian, controls the operations, policy, and direction of AWE and can veto actions of the company. The MoD provides most of the funding for AWE.

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Overview

Since 1945, seven nations—China, France, India, Pakistan, Russia, the United Kingdom, and the United States—have developed and currently deploy nuclear weapons. In addition, North Korea tested a low-yield nuclear explosive device in October 2006 and announced that it had conducted another nuclear test in May 2009,¹ and Israel is generally thought to possess nuclear weapons, although it maintains a policy of ambiguity on this matter. This report describes the organizations controlling research and development (R&D) on nuclear weapons (i.e., nuclear explosive devices, as distinct from the bombers and missiles that carry them) in these nations, and presents a brief history of the organizations controlling nuclear weapons R&D in the United States. It discusses whether these organizations are civilian or military, though in many nations the lines between civilian and military are blurred. This information may be of use to Members of Congress and their staff interested in nuclear weapons, nuclear proliferation, and arms control matters.

United States

The U.S. program for research, development, and production of nuclear weapons began during World War II. It was initially under the control of the Office of Scientific Research and Development, a civilian agency within the Executive Office of the President. In 1942, control shifted to the Army, in substantial part because the Army had the capability to manage projects to design and build the massive plants to produce uranium and plutonium for atomic bombs.² In 1945 and 1946, debate raged in Congress, the White House, the War Department, and among scientists and the public about whether to place atomic energy under civilian or military control.³ Congress resolved the issue in favor of civilian control of atomic energy in the Atomic Energy Act of 1946 (P.L. 79-585).⁴ That act created the Atomic Energy Commission (AEC) to develop nuclear weapons and, more generally, to foster and control research into atomic energy. The AEC was an independent organization, separate from the War Department and, later, from the Department of Defense (DOD). Ever since, nuclear weapons R&D has been conducted by the AEC and its successor organizations, all of which have been under civilian control and separate from DOD.⁵

The Atomic Energy Act of 1954 (P.L. 83-703), as amended, replaces the Atomic Energy Act of 1946.⁶ The Nuclear Regulatory Commission states that the 1954 act “is the fundamental U.S. law on both the civilian and the military uses of nuclear materials.”⁷

¹ Since no radioactive materials (particles or gases) were reported to have been detected from the 2009 explosion, it is not certain that that event was in fact a nuclear test.

² Richard Hewlett and Oscar Anderson, Jr., *The New World, 1939/1946, Volume I: A History of the United States Atomic Energy Commission* (University Park, PA, The Pennsylvania State University Press, 1962), pp. 71-83.

³ *Ibid.*, pp. 7, 408-411.

⁴ “Atomic Energy Act of 1946 (Public Law 585, 79th Congress), Excerpted from ‘Legislative History of the Atomic Energy Act of 1946 (Public Law 585, 79th Congress),’” Compiled by James D. Nuse, AEC Headquarters Library, Volume 1, Principal Documents, U.S. Atomic Energy Commission, Washington, 1965, <http://www.osti.gov/atomicenergyact.pdf>.

⁵ For a detailed timeline of the history of DOE and its predecessor agencies, see “Energy Timeline” at the DOE website at <http://www.energy.gov/about/timeline.htm>.

⁶ The Act, as amended, is available at 42 USC 2011 et seq., <http://www.law.cornell.edu/uscode/html/uscode42/> (continued...)

The Energy Research Reorganization Act of 1974 (P.L. 93-438) abolished the AEC. It established the Nuclear Regulatory Commission, which regulated civilian uses of nuclear energy; the Energy Research and Development Administration (ERDA), which was in charge of nuclear weapons, among other things; and the Energy Resources Council. In 1977, the Department of Energy Organization Act (P.L. 95-91) abolished ERDA and the Federal Energy Administration and established the Department of Energy (DOE).

In 1999, Title XXXII of P.L. 106-65, National Defense Authorization Act for FY2000, established the National Nuclear Security Administration (NNSA) as a semiautonomous agency within DOE. Regarding the semiautonomous status, that act stated:

SEC. 3213. STATUS OF ADMINISTRATION AND CONTRACTOR PERSONNEL WITHIN DEPARTMENT OF ENERGY.

(a) Status of Administration Personnel.—Each officer or employee of the Administration, in carrying out any function of the Administration—

(1) shall be responsible to and subject to the authority, direction, and control of—

(A) the Secretary acting through the Administrator and consistent with section 202(c)(3) of the Department of Energy Organization Act;

(B) the Administrator; or

(C) the Administrator's designee within the Administration; and

(2) shall not be responsible to, or subject to the authority, direction, or control of, any other officer, employee, or agent of the Department of Energy.

Section 3203 states that the Secretary of Energy “shall be responsible for establishing policy” for NNSA, while Section 3251 requires that NNSA’s budget shall be treated separately in the DOE budget.

NNSA’s Office of Defense Programs is responsible for such nuclear weapons work as R&D, production, transportation between DOE sites and between DOE and DOD sites, maintenance of weapons (except for minor maintenance at DOD sites), and dismantlement. NNSA’s other major program areas are Defense Nuclear Nonproliferation (DNN) and Naval Reactors. DNN’s Office of Fissile Materials Disposition is responsible for the disposition of surplus plutonium and highly enriched uranium. The Nuclear Weapons Council coordinates NNSA and DOD work on nuclear weapons. The council was established pursuant to P.L. 99-661, FY1987 National Defense Authorization Act, Section 3137.⁸ According to DOD, the members of the council are the Under Secretary of Defense for Acquisition, Technology, and Logistics, the Vice Chairman of the Joint Chiefs of Staff, the Under Secretary for Nuclear Security of the Department of Energy (who is

(...continued)

usc_sec_42_00002011----000-.html.

⁷ U.S. Nuclear Regulatory Commission, “Our Governing Legislation,” <http://www.nrc.gov/about-nrc/governing-laws.html#aea-1954>.

⁸ See 10 USC 179, at http://www.law.cornell.edu/uscode/html/uscode10/usc_sec_10_00000179----000-.html.

also the Administrator of NNSA), and the Under Secretary of Defense for Policy; there are also 10 nonvoting observers.⁹

At present, NNSA's nuclear weapons activities are conducted at eight sites: Los Alamos National Laboratory (NM), Lawrence Livermore National Laboratory (CA), and Sandia National Laboratories (NM and CA), all of which conduct weapons R&D; Pantex Plant (TX), Kansas City Plant (MO), and Y-12 National Security Complex (TN), all of which are involved in the production, maintenance, and dismantlement of nuclear weapons; the Savannah River Site (SC), which processes tritium, a key ingredient of nuclear weapons; and the Nevada National Security Site (NV, formerly Nevada Test Site). While the last U.S. nuclear test was conducted in September 1992, the Nevada National Security Site conducts weapons-related experiments not involving nuclear explosions and remains available to conduct nuclear tests if needed. A DOE website contains summary and detailed DOE budget requests for FY2005-FY2012.¹⁰ (Written by Jonathan Medalia, Specialist in Nuclear Weapons Policy.)

China

The research, development, testing, and production of nuclear weapons in the People's Republic of China (PRC) appear to be under the control of the military, which is collectively called the People's Liberation Army (PLA). The work is conducted by the China Academy of Engineering Physics (CAEP), a large organization that encompasses many research institutes. CAEP seems to report to the Science and Technology Commission of the PLA's General Armaments Department (GAD), which was organized in 1998. The PLA, through the GAD, also controls the nuclear weapon test base at Lop Nur in the northwestern Xinjiang region. At the same time, the PRC's defense industrial policy has integrated military and civilian efforts, including work at military and civilian institutes and universities. The China National Nuclear Corporation (CNNC) is a defense industrial state-owned conglomerate that plays a role in nuclear weapons development, civilian nuclear power plants, enrichment, and other related nuclear facilities. In 2008, CNNC was re-organized as one of 11 defense industrial conglomerates under the Ministry of Industry and Information Technology (MIIT), a "super ministry." The MIIT seems to fall under the State Council (similar to a Cabinet) and the Central Military Commission (the Communist Party of China's command authority of the PLA). Other PRC organizations reportedly involved with nuclear warhead design include: China Institute of Atomic Energy, China Institute of Radiation Protection, China Aerospace Science and Technology Corporation (CASC), and China Academy of Sciences.¹¹ (Written by Shirley Kan, Specialist in Asian Security Affairs.)

⁹ U.S. Department of Defense. Office of the Deputy Assistant to the Secretary of Defense for Nuclear Matters. "Nuclear Weapons Council," updated August 1, 2009, <http://www.acq.osd.mil/ncbdp/nm/nuclearweaponscouncil.html>.

¹⁰ U.S. Department of Energy. Office of the Chief Financial Officer, *Office of the Chief Financial Officer Products and Services*, <http://www.cfo.doe.gov/crorg/products.cfm>, and select "Budget Justifications & Supporting Docs" from the drop-down menu.

¹¹ This section on the PRC is based on unclassified sources that include: Tai Ming Cheung, *Fortifying China* (Cornell University Press, 2009); Thomas Reed and Danny Stillman, "The Nuclear Express," *Wall Street Journal*, January 16, 2009; Thomas Reed, "The Chinese Nuclear Tests, 1964-1996," *Physics Today*, September 2008; numerous articles published by CAEP, CNNC, MIIT, and PRC and Hong Kong media; Nuclear Threat Initiative (<http://www.nti.org>); Wendell Minnick, "China's Central Nuke Storage ID'd," *Defense News*, March 8, 2010; and Mark Stokes, "China's Nuclear Warhead Storage and Handling System," Project 2049 Institute, March 12, 2010.

France

France's nuclear weapons R&D is supervised by the French Ministry of Defense, which delegates the direction of these programs to the French Atomic and Alternative Energy Commission (*Commissariat à l'énergie atomique et aux énergies alternatives*, or CEA).¹² CEA was established in 1945 and is "a public entity ... Independent in terms of administration and finances."¹³ It "is active in four main areas: low-carbon energies; defense and security, information technologies and health technologies."¹⁴

According to the Embassy of France, CEA's general programs are determined by a committee, *Comité à l'Energie Atomique*, which is chaired by the French Prime Minister. The CEA Chairman serves as "a sort of Chief Executive Director" of the organization. He or she is appointed by the government, chairs the CEA Board, and is a permanent member of the aforementioned *Comité*. A High Commissioner, also appointed by the government, is tasked with advising the CEA Chairman on scientific and technical issues. The High Commissioner chairs the CEA Scientific Committee and is usually a member of the *Comité*.

CEA activities in the military field are carried out in the CEA's *Direction des Applications Militaires* (DAM). DAM's activities are supervised by the Ministry of Defense, but program management is in large part delegated to CEA. A Commission, the *Comité Mixte Armées-CEA*, oversees program execution, particularly the financial aspects. As is the case for other CEA directorates, DAM is not a part of the Ministry of Defense or any other government Ministry.

CEA receives its funding from several government ministries and directorates: the Ministry of Ecology and Sustainable Development; the General Directorate for Energy and Climate; the Ministry for Higher Education and Research; and the Ministry of Defense. Funding decisions are based on a common CEA strategy, but each ministry submits to parliament a separate budget proposal for programs in its area. (Written by Paul Belkin, Analyst in European Affairs.)

India

The organizations concerned with research and development for India's nuclear weapons all appear to be controlled by the Department of Atomic Energy (DAE), which was set up in 1954 under the direct charge of the Prime Minister.¹⁵ The Department continues to function under the direct control of the Prime Minister. According to publicly available information from the DAE, the Department includes facilities widely believed by experts to be part of (or potentially part of) India's nuclear weapons program, including nuclear reactors, reprocessing facilities, and enrichment facilities.¹⁶ All of these facilities appear to be under the control of the Bhabha Atomic Research Centre and the Indira Gandhi Centre for Atomic Research, both of which are part of the DAE. (Written by Paul Kerr, Analyst in Nonproliferation.)

¹² Unless otherwise noted, information in this section provided by the Embassy of France, Washington, DC.

¹³ E-mails from the embassy of France, February 2009.

¹⁴ Commissariat à l'énergie atomique, "Facts and Figures," http://www.cea.fr/english_portal/cea/identity. For an organization chart, see http://www.cea.fr/english_portal/cea/identity/organization_chart.

¹⁵ Statement from the Atomic Energy Commission. Available at <http://www.aec.gov.in/>.

¹⁶ Information about organizations under control of the DAE is available at http://www.barc.gov.in/dae_units.html.

Israel

Israel follows a policy of strategic ambiguity or nuclear opacity regarding its nuclear weapons program, neither confirming nor denying its existence.¹⁷ Its officials simply state that Israel would not be the first to introduce nuclear weapons into the region, without explaining what that means. Israel believes that this policy enhances its deterrence. Therefore, the Office of the Military Censor does not permit reporting on the country's nuclear infrastructure, facilities, and organizations. Nonetheless, there have been many reports alleging and concerning Israel's nuclear weapons program.¹⁸ Indeed, as far back as 1974, a U.S. Special National Intelligence Estimate stated, "We believe that Israel already has produced and stockpiled a small number of fission weapons."¹⁹

Israel's nuclear program is under civilian control. In 1952, the Israel Atomic Energy Commission (IAEC) was created to advise the government on nuclear policy and on nuclear research and development priorities, and to implement policies. In 1957, then Director General of the Ministry of Defense (now President) Shimon Peres sidelined the IAEC during the development of the nuclear center at Dimona and gave the responsibility for developing the center to the Armament Development Authority in the Ministry of Defense. As are all other aspects of the IAEC's operations, its relations with the military are classified. The IAEC was restructured in 1966, when it reportedly assumed overall responsibility for Israel's nuclear weapons program.²⁰ The Director General of the IAEC officially reports directly to the prime minister, who often delegates the responsibility to another minister in order to build up a portfolio for political purposes. With the active involvement of Prime Minister Benjamin Netanyahu's Office, Deputy Prime Minister and Minister of Intelligence and Atomic Energy Dan Meridor is responsible for oversight of the IAEC in the government that took power in March 2009. In August 2007, then Prime Minister Ehud Olmert named Dr. Shaul Horev (alternate transliteration: Chorev), formerly deputy chief of the Israeli navy and then head of a secret "special means unit" within the Defense Ministry, to be the new Director General of the IAEC.

¹⁷ A consensus among media and expert reports is that Israel possesses a nuclear arsenal of 100 to 200 weapons, although some suggest a higher figure. See Nuclear Threat Initiative, "Israel Nuclear Facilities," http://www.nti.org/e_research/profiles/Israel/Nuclear/facilities.html, and Douglas Frantz, "Israel Gains Full Nuclear Arsenal," *Los Angeles Times*, October 12, 2003, among others. National Public Radio reporter Eric Weiner used the range of 200 to 400 nuclear weapons, citing the CIA as his source, in a report on All Things Considered, March 22, 2001. In April 2010, ahead of President Obama's nuclear summit, the London-based Jane's Information Group reported that Israel has between 100 and 300 nuclear weapons, according to Yaakov Katz, "'Israel is World's 6th Largest Nuclear Power,'" *Jerusalem Post*, April 11, 2009.

¹⁸ The most notable revelations may have been those of Mordechai Vanunu, a former technician at Israel's nuclear reactor complex, who provided data on and photographs of the nuclear reactor center at Dimona to the *Sunday Times* (London) in 1986. Vanunu reported that Israel had been building nuclear weapons for 20 years and possessed a stockpile of between 100 and 200 warheads. In 1988, Israel convicted Vanunu of espionage and treason for selling secrets to the *Times*, but did not admit that his disclosures were truthful. Several books rely on Vanunu's information, including Yair Evron, *Israel's Nuclear Dilemma*, Ithaca: Cornell University Press, 1994, and Seymour Hersh, *Samson Option*, New York, Vintage Books, 1993. Other sources include Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998), p. 1, and "Completing the Deterrence Triangle," Carnegie Endowment for International Peace, Non-Proliferation Project, v. 3, no. 18, June 29, 2000.

¹⁹ U.S. Director of Central Intelligence, *Special National Intelligence Estimate: Prospects for Further Proliferation of Nuclear Weapons*, SNIE 4-1-74, 1974, p. 20.

²⁰ Federation of American Scientists, <http://www.fas.org/nuke/guide/israel/agency/iaec.htm>.

The IAEA directs research at the Center for Nuclear Research at Nahal Sorek (alternative transliteration: Soreq) south of Tel Aviv and at the larger Center for Nuclear Research in the Negev south of Dimona. According to journalists, the Ministry of Defense provides most of the operating funds for the research centers. The Ministry of Defense is headed by a civilian minister, who is often, but not always, a retired general. In the current government, the minister is former Chief of Staff of the Israel Defense Forces Lt. Gen. Ehud Barak (Ret.). The Sorek center reportedly conducts nuclear weapons research and design. Dimona is the site of the nuclear reactor and fissile material processing plant, and reportedly both highly enriched uranium and plutonium are produced there.²¹

In March 2010, Israel announced plans to build a third, civilian nuclear reactor in order to produce electricity and expressed willingness to subject it to nuclear safeguards.²² The statement indicates that Israel does not intend to use it for nuclear weapons R&D purposes. (Written by Carol Migdalovitz, former Specialist in Middle Eastern Affairs, now retired.)

North Korea²³

Policy-making toward North Korea's nuclear program has been vested in the National Defense Council since 1991. North Korean leader Kim Jong-il heads this body. The other members represent the North Korean Workers (Communist) Party and the North Korean military. Kim Jong-il has had the supreme decision-making authority on nuclear policy since he succeeded his father, Kim Il-sung in 1994. However, in August 2008, he suffered a severe stroke. Since then, a collective decision-making apparatus has emerged, apparently headed by his brother-in-law, Chang song-taek. It contains key North Korean military commanders, and the military has been more influential in the policy-making context since Kim's stroke. While U.S. and South Korean intelligence officials have stated that Kim Jong-il appears to have partially recovered from the stroke, most experts believe the leaders in this collective group will continue to have an important policy-formulation role in the future. In addition, the regime appears to be preparing the way for a planned succession. Kim Jong-un, Kim Jong-il's third son, became a four-star general of the Korea People's Army and later was appointed as vice-chairman of the Central Military Commission. These steps, together with his appearance by his father's side during military exercises, indicate that he is the designated heir to lead the country.

At the top of the operational organization is North Korea's Ministry of Atomic Energy Industry, a full-fledged cabinet ministry. Under this ministry, there are a number of nuclear-related organizations and research centers. There are two committees: an Isotope Application Committee and a Nuclear Energy Committee. The Ministry also directs a nuclear research center at Yongbyon, the site of North Korea's known plutonium facilities. There also is a nuclear energy institute in Pyongyang, the capital.

The Yongbyon nuclear research center consists of 10 branches: (1) Uranium Resources Development Institute; (2) Nuclear Physics Institute; (3) Radiochemical Laboratory (plutonium

²¹ Nuclear Threat Initiative, "Israel Nuclear Facilities."

²² Daniel Horner, "Israel States Strong Interest in Nuclear Energy," *Arms Control Today*, Vol. 40, Iss. 3, April 2010.

²³ This section is based largely on *North Korea's Weapons of Mass Destruction: Problems and Prospects*, edited by Kim Kyong-soon, Hollym Publishers, 2004. See also CRS Report RL34256, *North Korea's Nuclear Weapons: Technical Issues*, by Mary Beth Nikitin.

reprocessing); (4) Nuclear Material Institute; (5) Nuclear Energy Research Institute; (6) Isotope Utilization Institute; (7) Neutron Physics Institute; (8) Reactor Design Institute; (9) Nuclear Electromagnetics Institute; (10) Radiation Protection Institute.

Under this organization framework, the South Korean government estimates that there are about 20 nuclear facilities. The main ones at Yongbyon are a 5-megawatt nuclear reactor, a plutonium reprocessing plant, a newly built gas centrifuge uranium enrichment plant, and initial construction on a 100 megawatt-thermal (approximately 25-30 megawatt electric) light-water reactor.²⁴ There also are at least five uranium mining and milling facilities. It also is believed that North Korea has facilities for storing its stockpile of plutonium, which it has produced at Yongbyon, and for storing a few nuclear weapons that it may have produced. U.S. officials have also stated that they believe North Korea operates clandestine uranium enrichment facilities as well.²⁵ The South Korean government estimates that there are about 3,000 people working throughout North Korea's nuclear facilities.²⁶ (Written by Mary Beth Nikitin, Analyst in Nonproliferation.)

Pakistan

The National Command Authority (NCA) supervises the functions and administration of all of Pakistan's organizations involved in nuclear weapons research, development, and employment, as well as the military services that operate the strategic forces.²⁷ The Prime Minister is Chairperson of the NCA.²⁸ Other members of the NCA include senior military and civilian officials.²⁹ The NCA, as Pakistan's main decision-making body for nuclear weapons issues, is made up of two committees. One, the Development Control Committee (DCC), includes several military officials; its Deputy Chairperson is also the Chair of the Joint Chiefs of Staff. The DCC "exercises technical, financial and administrative control over all strategic organisations, including national laboratories and research and development organisations associated with the development and modernisation of nuclear weapons."³⁰ The second is the Employment Control Committee. A

²⁴ Hecker, "A Return Trip to North Korea's Yongbyon Nuclear Complex," Center for International Security and Cooperation, Stanford University, November 20, 2010. <http://iis-db.stanford.edu/pubs/23035/HeckerYongbyon.pdf>.

²⁵ Amb. Glyn Davies, "U.S. Statement to the IAEA: DPRK," IAEA Board of Governors Meeting, December 2-3, 2010, <http://vienna.usmission.gov/101202dprk.html>.

²⁶ "N. Korea Employs 3,000 Workers in 20 Nuclear Facilities," *Asia Pulse*, October 22, 2009.

²⁷ December 2007 Ordinance To Provide For The Constitution And Establishment Of National Command Authority.

²⁸ When the NCA was established in 2000, the government's announcement designated the Head of Government, or Prime Minister, as Chairperson. At that time, General Musharraf, as Chief Executive, became Chairperson and stayed in that position after becoming President in 2002. He appointed the Prime Minister as Vice Chairman. However, President Zardari returned the NCA to its original structure when, in a November 2009 re-promulgation of the 2007 NCA Ordinance, he specified that the Prime Minister would be Chairperson, removing himself from that position. This re-promulgation also abolished the position of Vice Chairman.

²⁹ December 2007 Ordinance.

³⁰ *Nuclear Black Markets: Pakistan, A.Q. Khan and the Rise of Proliferation Networks*, (London, International Institute of Strategic Studies, 2007), p. 111; Pakistan Announcement of Nuclear-Weapons Command-and-Control Mechanism, *Associated Press of Pakistan*, February 3, 2000. *Nuclear Black Markets*, pp. 110-111, has organization charts of the NCA and SPD.

Strategic Plans Division (SPD) acts as the secretariat for the NCA.³¹ The SPD is tasked with the daily management of Pakistan's strategic assets and has oversight over the "Strategic Organizations," which include Pakistan Atomic Energy Commission and Dr. A.Q. Khan Research Laboratories; it oversees "the systematic progress of weapon systems."³² (Written by Paul Kerr, Analyst in Nonproliferation.)

Russia

The Russian Federation has continued the Soviet pattern of civilian government control of the nuclear infrastructure, including military and civilian programs. The Soviet Union's nuclear weapons program began in the late phases of World War II and developed into 10 closed "nuclear cities." The Soviet nuclear complex was under the Soviet Ministry of Atomic Power and Industry, which in 1992 became the Ministry for Atomic Energy (MinAtom). The Russian Federation inherited the vast majority of the Soviet Union's nuclear assets. After government restructuring in 2004, MinAtom became the Federal Agency for Atomic Energy (FAAE, known as Rosatom). After being appointed head of the agency, former Prime Minister Sergei Kiriyenko led a restructuring of the nuclear complex to facilitate an expansion of nuclear power exports and international collaboration. A 2007 law, the "Tunnel Law," consolidated all civilian nuclear assets under a new joint stock company, Atomenergoprom, under Rosatom. A further restructuring converted Rosatom itself from a federal agency to a government-owned corporation, the Rosatom State Atomic Energy Corporation (which retained nearly all of its functions as a government agency). Kiriyenko, who stayed in his post as head of the organization, is accountable to the Prime Minister of the Russian Federation. Rosatom manages Atomenergoprom and is directly responsible for defense-related nuclear work, nuclear science, the back end of the fuel cycle, and nuclear safety and security matters.

Rosatom's Nuclear Weapons Complex branch is responsible for developing, testing, producing, and dismantling all nuclear weapons. The Nuclear Weapons Complex branch consists of two divisions: the Nuclear Weapons Production Division and the Development and Testing Division. The latter oversees the two major Russian nuclear weapon design research institutes—the All-Russian Scientific Research Institute for Experimental Physics in Sarov (VNIIEF) and the All-Russian Scientific Research Institute for Technical Physics in Snezhinsk (VNIITF), founded in 1946 and 1955, respectively. A number of research centers also participate in nuclear weapons work. Russia also maintains a test site at Novaya Zemlya. The Ministry of Defense oversees the storage and deployment of nuclear weapons.³³ (Written by Mary Beth Nikitin, Analyst in Nonproliferation.)

³¹ The SPD is headed by a Director General from the Army.

³² *Nuclear Black Markets*, p. 111.

³³ Unclassified Nuclear Proliferation Assessment Statement Pursuant to Section 123 a. of the Atomic Energy Act of 1954, as Amended, With Respect to the Proposed Agreement Between the Government of the United States of America and the Government of the Russian Federation For Cooperation in the Field of Peaceful Uses of Nuclear Energy, May 1, 2008; "Russia Profile: Nuclear Research Facilities," Nuclear Threat Initiative, http://www.nti.org/e_research/profiles/Russia/Nuclear/facilities_research.html; and Rosatom State Corporation website, <http://www.minatom.ru/>.

United Kingdom

The Atomic Weapons Establishment (AWE) is responsible for the design, production, assembly, and maintenance of the UK's nuclear weapons, as well as decommissioning and disassembly.³⁴ The British government owns all AWE sites and assets, which are based at two facilities in Berkshire: Aldermaston and Burghfield. Government control of AWE is exercised by the civilian-led Ministry of Defence (MoD) and vested in its top official, the Secretary of State for Defence.³⁵ Since creation of this post in 1964, this official has always been a civilian, a Member of Parliament, and a member of the Prime Minister's cabinet. Within the MoD structure, the Minister of State for Defence Equipment, Support and Technology, also a civilian and a Member of Parliament, has specific lead responsibility for government policy and direction regarding AWE.

In 1993, AWE was made a government-owned, contractor-operated entity, and its management was contracted to the private consortium Hunting-BRAE. In 2000, the MoD awarded a new 10-year contract to AWE Management Limited (AWE ML), which was then a partnership of Lockheed Martin, Serco, and British Nuclear Fuels Limited. In 2003, this contract was extended through 2025. With the management contract, AWE ML took over the operating company AWE plc, which handles day-to-day operations and employs the workforce of around 4,500 staff and 2,000 contractors. The MoD retains a "golden share"—a nominal share allowing it to veto corporate action—in AWE plc. In December 2008, Jacobs Engineering Group Inc. acquired British Nuclear Fuels Limited's share of AWE ML. AWE ML is contractually obligated to consult with the government regarding all such changes in the composition of its ownership.³⁶

The great majority of funding for AWE comes from the UK defense budget, primarily under allocations for the Defence Equipment and Support (DE&S) section of the MoD.³⁷ The Directorate Strategic Weapons of DE&S manages the AWE contract, leading MoD monitoring and liaison with AWE ML to ensure the execution of government decisions regarding Britain's strategic requirements.³⁸ AWE facilities are subject to the same regime of licensing and safety regulations as civil nuclear plants, and are regularly inspected for compliance by the Nuclear Installations Inspectorate, a division of the Nuclear Directorate of the UK Health and Safety Executive.³⁹

An agreement signed by the United Kingdom and France in November 2010 promises unprecedented cooperation between the two countries with regard to nuclear weapons testing and

³⁴ AWE's mission also covers nuclear threat reduction, including threat assessment, response to defense-related nuclear incidents, and verification (for example, monitoring Comprehensive Test Ban Treaty compliance and conducting research into future multilateral arms control regimes). See AWE website, <http://www.awe.co.uk/>.

³⁵ See statement by The Parliamentary Under-Secretary of State, Ministry of Defence (Baroness Taylor of Bolton) in *Atomic Weapons Establishment*, Lords Hansard Written Answers, January 26, 2009, Column WA3.

³⁶ See Stephen Jones, *Recent developments at the Atomic Weapons Establishment*, House of Commons Library, March 24, 2009, <http://www.parliament.uk/briefingpapers/commons/lib/research/briefings/snua-05024.pdf>; and AWE website, http://www.awe.co.uk/aboutus/the_company_eb1b2.html.

³⁷ A small percentage of AWE's funding is understood to come from other government departments, with this money allocated mainly for its threat reduction mission.

³⁸ Lords Hansard Written Answers, op. cit.

³⁹ See Henrietta Wilson, "Renewing Trident: Can the UK's Atomic Weapons Establishment Cope?," *Disarmament Diplomacy*, no. 88 (Summer 2008).

research. Under the treaty, the UK and France are expected to jointly develop, operate, and staff a facility for simulated warhead testing at the Valduc research center in France and a technology research and development center, featuring a new hydrodynamics modeling laboratory, at AWE Aldermaston.⁴⁰ (Written by Derek Mix, Analyst in European Affairs.)

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⁴⁰ Roland Watson and Tom Coghlan, "Britain and France shake on nuclear pact; Testing and development facilities to be pooled," *The Times (London)*, November 2, 2010; and Anglo-French defence treaty: at a glance," *The Daily Telegraph*, November 2, 2010.