Nuclear Security: A Turkish Perspective

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NUCLEAR SECURITY: A TURKISH PERSPECTIVE

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Hare Sokak K8 No:16,
Akatlar, 34335 Istanbul
Tel : +90 212-352 1854
Email : info@edam.org.tr
www.edam.org.tr

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About the Authors

Dr. Ahmet K. Han is with the faculty of International Relations at Kadir Has University in Istanbul. His research interests are strategic thinking, negotiations and foreign policy analysis. Dr. Han holds a B.A. in economics and international relations, an MA on political history and a Ph. D. on international relations from the Istanbul University and has studied negotiations in Harvard. He has been awarded a "Young Leaders of Europe" grant on U.S. Foreign policy by the Department of State of the U.S.A. and has been an observer for NATO on the state of the NATO/ISAF Operation in Afghanistan twice, in 2005 and 2011. He has published extensively on Afghanistan, geo-strategy of energy politics, US Foreign Policy and Turkish foreign policy. Dr. Han has worked as a columnist in Turkish dailies Radikal and Referans. He is also the chief editorial advisor of the Turkish edition of the New Perspectives Quarterly. Dr. Han has extensive experience as an adviser and consultant to private sector in the field of strategic business development and negotiations. He has also served as the International Relations Advisor for Turkish Exporters Assembly, the umbrella organization of Turkey's exporting industries between 2003 - 2006. He has lectured for and held academic posts in Istanbul University, Bilgi University, İstanbul Commerce University, Turkish Armed Forces (TAF) War Academy (Staff College) and Air Force War College. From 2005 to 2008 Dr. Han was responsible for structuring and teaching of the "International Negotiation Strategies" course module for TAF, a must course for all senior officers assigned to international military postings including NATO. He has also served as a visiting scholar in University of St. Andrews's Center for Syrian Studies in Scotland in 2011.

Aaron Stein is an associate fellow at the Royal United Services Institute (RUSI). He is also a researcher at the Center for Economics and Foreign Policy Studies in Istanbul, where he works on security and proliferation issues in the Middle East. He is currently a PhD candidate at King's College London, researching Iranian and Turkish nuclear decisionmaking. Stein has written extensively on Turkish politics and regional proliferation, publishing in scholarly journals and print media, including the New York Times, Foreign Affairs, Foreign Policy, the Bulletin of the Atomic Scientists, the National Interest, and World Politics Review. He holds a BA in political science from the University of San Francisco and an MA in international policy studies with a specialization in nuclear nonproliferation from the Monterey Institute of International Studies.

Prof. Dr. Mustafa Kibaroglu is the Chair of the Department of Political Science and International Relations at the newly established MEF University in Istanbul since July 1, 2014. Previously he waschair of the department of international relations and director of the Center for Eurasian Studies and the graduate program in international relations at Okan University, Istanbul and Vice Chair in the Department of International Relations at Bilkent University in Ankara. He works on nonproliferation and security issues and has held fellowships at the Belfer Center for Science and International Affairs, Harvard University; the Center for Nonproliferation Studies, Monterey Institute of International Studies; and the Mountbatten Center for International Studies, University of Southampton. He is the author (with Aysegul Kibaroğlu) of Global Security Watch—Turkey: A Reference Handbook (Praeger Security International, 2009) and has edited and contributed to several edited volumes on Turkish security issues. He received his PhD in international relations from Bilkent University in 1996 and his MA in economics from Boğaziçi University in 1990.

Doruk Ergun is a research fellow at the Center for Economics and Foreign Policy Studies (EDAM), where he works on Turkish foreign policy and security issues. He was previously a research assistant at the NATO Parliamentary Assembly. Ergun received his MA in international affairs with a focus on international security studies from the George Washington University in 2011 and his BA in social and political sciences from Sabancı University in 2009.

Dr. Can Kasapoğlu is a security studies specialist and military analyst. He has held several visiting researcher posts, including at the Begin-Sadat Center for Strategic Studies (BESA Center) in Israel (2012) and at the Fondation pour la Recherche Stratégique in France (2014). He is currently a research fellow in the Istanbul-based Center for Economics and Foreign Policy Studies and a faculty member at Girne American University. Kasapoğlu specializes in war studies, strategic weapon systems, missile defense, biological and chemical warfare, low-intensity conflicts, terrorism, strategic intelligence, and civil-military relations. In addition, he also focuses on strategic affairs in the Middle East, Iranian military modernization, and Turkish-Israeli relations. Kasapoğlu holds a PhD from the Strategic Research Institute at the Turkish War College, and an MSci degree from the Defense Sciences Institute at the Turkish Military Academy

Prof. Dr. Mitat Çelikpala is Professor of International Relations at Kadir Has University, Istanbul where he teaches graduate and undergraduate courses on Eurasian Security, energy and critical infrastructure security, Turkish Foreign Policy and the Caucasus politics, security and history, and supervises doctoral dissertations in these areas. His areas of expertise are the Caucasus, North Caucasian Diaspora, people and security in the Caucasus and Black Sea regions, Turkish-Russian relations, energy security and critical infrastructure protection. In addition to Kadir Has University, he lectured in Bilgi University, Turkish War College and Turkish National Security and Military academies on Turkish foreign policy, politics, history and security in the Caucasus and Central Asia and Turkish political structure and life. He served as an academic advisor to NATO's Center of Excellence Defense against Terrorism in Ankara, especially on the critical infrastructure protection. He has several numbers of published academic articles and media coverage and analyses on above-mentioned areas.

Sinan Ülgen graduated in 1987 from the University of Virginia with a double major in computer sciences and economics. He undertook graduate studies at the College of Europe in Brugge, Belgium where he received, in 1990, a masters degree in European economic integration. He then joined the Turkish Foreign Service as a career diplomat.

In 1992, he was posted to the Turkish Permanent Delegation to the European Union in Brussels where he became part of the team that negotiated the Turkey-EU customs union.

Ulgen is also the chairman of the Istanbul based think tank, Center for Economics and Foreign Policy Studies (EDAM) and a visiting scholar at Carnegie Europe in Brussels. His research and opinion pieces have been published by the Carnegie Endowment for International Peace, Center for European Policy Studies, Center for European Reform, the Atlantic Council, German Marshall Fund, Brookings and the World Economic Forum as well as newspapers such as Le Figaro, Financial Times, Wall Street Journal, European Voice, Project Syndicate and the International New York Times. He is also the co-author of a book on Turkey-EU relations with Kemal Dervis and a frequent commentator on Turkish affairs in the international press. Ulgen is the academic advisory board member of the NATO Defence College in Rome and was a member of the international policy experts group setup by the NATO Secretary General Rasmussen.

INTRODUCTION – Sinan Ulgen

For more than six decades, Turkish officials have advocated for the development of nuclear energy to help decrease the country's reliance on imported fossil fuels. In 2010, Turkey concluded an agreement with Russia's Rosatom for the construction of four VVER-1200 reactors at the Akkuyu site, near the coastal city of Mersin. Just three years later, in May 2013, Turkey signed an agreement with a Mitsubishi led consortium to build a second nuclear power plant near the city of Sinop.

Turkey faces a number of unique security threats that it will have to contend with as it continues to develop nuclear power. This study, which details many of these challenges, is the first of its kind for Turkish nuclear industry. As this study notes, Turkey is a known transit route for nuclear smuggling, has experienced decades of terror attacks, and currently borders two conflict zones in Iraq and Syria. These challenges are not limited to Turkey, but nevertheless, as a new nuclear state, Ankara has an incentive to identify potential threats and adopt comprehensive policies to protect the country's future nuclear power plants and related infrastructure.

Turkey, as a prospective holder of nuclear energy infrastructure and as a state that has suffered from terrorism for decades, will need to develop a sophisticated risk assessment for its nuclear program that goes well beyond conventional security strategies. This book presents critical findings and address key challenges of countering nuclear and radiological terrorism for Turkish decision-makers, as well as experts of this field.

Effective nuclear security in Turkey will include measures designed to protect from the insider threat, physical security, cyber security, development of a design basis threat, and learning from international guidance and accepted best practices. Physical security involves a wide array of measures, ranging from site selection to what forces and which assets will be used to defend the facility. Turkish decision makers and nuclear planners need to carefully analyze which groups have the potential to attempt infiltrating, penetrating or attacking the future nuclear plants and the resources that they possess to use in this end. There are various approaches to securing nuclear facilities and, depending on its threat perception, Turkey should benefit from the lessons-learned and global best practices.

Cyber security is another aspect of the issue. This might be relevant to nuclear or radiological terrorism in two ways; first, a disruptive cyber-attack may precede physical attack/infiltration or theft, and second, it may be used to obtain design or security vulnerabilities. The past few years have shown that firewalls can be bypassed by USB drives and anti-virus systems can be penetrated by specifically tailored worms – methods which leave even closed nuclear sites vulnerable.

In Turkey, fresh fuel is not likely to be an attractive target for theft. Moreover, once "burned" in the reactor, the possibility that a potential attacker could steal spent fuel is also diminished, owing to amount of radioactivity. However, a potential attacker could opt to target the reactor itself, in order to cause a meltdown. An attacker could also try and breach the spent fuel pond. In other cases, insiders were used for nuclear theft. Thus, while Turkey may not have Highly Enricher Uranium, a potential attacker could use insiders to collect information for sabotage, or to help identify weaknesses for an attack on the reactor facility. Therefore how nuclear facilities are administered and regulated, how employers are hired and "fail-safes" against corruption factor heavily in a nuclear facility's security.

Turkey has had to face geopolitical imperatives of being situated at the crossroads of numerous smuggling routes originating from both the Caucasus and Middle

East. Turkish law enforcement agencies have intercepted nuclear materials smuggled through Georgia on multiple occasions, and there have been reports of the involvement of Turkish-speaking middlemen in some past nuclear transactions between smugglers and potential buyers. Turkey has mostly mountainous borders with Iran, Iraq, Armenia and Georgia, and long borders with Syria, and a considerable number of people in these regions are traditionally engaged in smuggling activities.

The following chapters provide a unique insight for policy makers interested in enhancing the security of Turkey's nuclear program. In particular, the book incorporates

a. An effective conceptualization of nuclear terrorism as a contribution to both the Turkish strategic community's perspective, and security studies literature's knowledge,

b. A clear view and strategic forecast which would prevent strategic, operational, and tactical surprises that might result from *failure of imagination*,

c. A practicable risk assessment with a relevant security paradigm that would serve Turkish decision makers and all global parties that seek the utmost goal of preventing nuclear and radiological terrorism and maintaining world-wide nuclear security,

d. Strategic analyses on nuclear terrorism and Turkey's security environment with respect to the possible (future) correlation between nuclear terrorism and proxy war trends.

Securing Turkey's Prospective Nuclear Energy Program: A Strategic Nuclear Security Risk Analysis

Doruk Ergun

Research Fellow, EDAM

Can Kasapoglu

Research Fellow, EDAM

Faculty Member, Girne American University

INTRODUCTION[1]

In the next decade, Turkey's energy demand is expected to double, rising roughly 7 percent per annum. As a country that possesses very limited cheap and clean energy sources, Turkey is heavily dependent on imported energy. Almost all of the oil and natural gas Turkey consumes is imported, and more than 70 percent of the country's total energy consumption is supplied through imports, according to World Bank data[2]. Hence, energy imports, which amounted to around $60 billion USD in 2012, are the leading factors behind the country's current account deficit.

Although the country possesses coal reserves, most of it consists of low-quality lignite coal and is a source of pollutant emissions. Even though Turkey has significant wind and solar power generation potential, these options are costly to develop and current grid conditions do not allow for the accommodation of sufficient amounts of renewable energy to make up for the country's energy deficit[3]. Hence, nuclear power rises as a favorable option for providing security of supply under current conditions. This option would provide electricity for a considerably low price – especially in the case of Akkuyu, due to its financing model – and would cut the growth of greenhouse gas emissions. Furthermore, the prospect of gaining know-how, experience, and expertise through hosting nuclear power plants provides another incentive for Turkish policy makers.

Even though Ankara has shown an interest in nuclear power generation at times over the last six decades, these attempts have collapsed due to political and economic reasons. The current Turkish leadership has taken solid steps in realizing this goal as the country has signed two deals, one an intergovernmental agreement with Russia over the construction of four VVER-1200 units in Akkuyu, Mersin; and another with the Japanese-French consortium ATMEA (consisting of Mitsubishi Heavy Industries and Areva) over the construction of four ATMEA-1 reactors in Sinop. The Turkish government aims all four units of VVER-1200 and for the first unit of ATMEA to start operations by 2023, as part of the government's 2023 goals marking the centennial of the Turkish Republic. Turkey's nuclear regulatory agency, Turkish Atomic Energy Authority (TAEK) has also stepped up its efforts to draw a regulatory framework, and Turkey continues to be an eager member of international nuclear safety and security arrangements, including those enacted by the International Atomic Energy Agency (IAEA)[4].

However, establishing nuclear power plants brings its risks as well as advantages. First, they would give Turkey an advantage in energy geopolitics and boost its national capacity. Second, in inter-state and irregular warfare, they would constitute high-value military targets. Third, damages to nuclear facilities through deliberate attacks, unintentional accidents or natural disasters may all have catastrophic results.

Nuclear power plants (NPP) utilize three major elements in their operation, which form the basis of their vulnerability to attacks. The first is the presence of hazardous radiological and nuclear materials used in the process of generating energy and the production of waste resulting from the fuel cycle. Sabotaging nuclear facilities, in extremis causing a meltdown, would have a tremendous effect on the people and environment surrounding the nuclear facility. Furthermore, the theft of such hazardous materials and their later dispersion (for example via "dirty bombs") by terrorist and criminal groups would pose a major threat to public safety and national security.

The second operational element that makes nuclear facilities vulnerable to attack is the critical information that goes into processing the radiological and nuclear materials. While not as vital as the know-how behind producing weapons-grade uranium or nuclear warheads, in the wrong hands, information regarding the inner workings of a nuclear facility and knowledge on handling nuclear and radioactive material could be used to plot future attacks via radiological dispersion. Those who possess this know-how, namely the employees of the facility and nuclear scientists, are important national assets and their safety is vital for a country's scientific and technological advancement. Information regarding the operation of NPPs, such as work schedules, facility plans, and safety and security precautions, are also critical since they can be exploited by potential assailants in planning future attacks.

Third and last, NPPs are part of the critical national infrastructure (CNI), and any disruption to their operation can result in substantial economic costs. Failing to protect high-value CNI like nuclear facilities has political costs for the government in charge and for the security forces responsible. A policy recommendation report presented by the Turkish Ministry of Transport, Maritime Affairs, and Communications defines CNI as "structures that, damages to or the destruction of which would hamper the continuity of public services and public order and; the partial or complete loss of their functionality would have detrimental effects on public health, safety, security and on economic activity and on the effective and efficient functioning of the government."[5]

Hence, a comprehensive assessment of the dangers facing critical national infrastructure is crucial. This is especially true for nuclear facilities because of the variety of vulnerabilities and the profound risks surrounding them. Yet, there are currently no open source documents published by Turkish government agencies or non-governmental organizations on the topic. This study aims to overcome this gap by providing an analysis on the potential risks to the physical security of Turkey's proposed nuclear energy infrastructure. It will first look into the potential threats to NPPs in general by analyzing their vulnerabilities. Here, the main focus will be on radiological sabotage, theft or diversion of sensitive and critical material[6], threats from insiders, and the accessing of sensitive information. While cyber-attacks will be inspected in the context of hybrid attacks, they remain outside the scope of this paper.[7] Subsequently, the paper will highlight regional trends and examine the potential for states in the region to target Turkey's civilian nuclear program directly or by proxy. The paper will then examine active terror organizations in Turkey and explore whether they would have the will and capability to attack Turkey's future nuclear infrastructure by looking into radical left-wing terror organizations, separatist terror organizations, and religious extremists operating both within and outside of Turkey.

An Introduction to the Physical Security of a Nuclear Power Plant and Its Surroundings

The United States Nuclear Regulatory Commission (U.S. NRC) regulation[8] (will be referred to as 10 CFR 73 henceforth) on the physical protection of nuclear power plants and materials specifies five types of threats to nuclear facilities: radiological sabotage, theft or diversion of nuclear material, internal threat, land and vehicle bomb assaults which may be coordinated with external assaults, and cyber-attacks.

Radiological Sabotage

Radiological sabotage aims to impede the intended safety functions of equipment and operator actions in a nuclear power plant and to cause significant core damage or radioactive leakage resulting from the absence of the said safety functions.[9] In addition to the numerous systems that make operating NPPs possible, nuclear plants are vulnerable in three primary areas: "controls on the nuclear chain reaction, cooling systems that prevent hot nuclear fuel from melting even after the chain reaction has stopped, and storage facilities for highly radioactive spent nuclear fuel."[10] While nuclear facilities are designed with many safety and security measures to compensate for these vulnerabilities, energy specialists Holt and Andrews point out that under severe circumstances, such as the events surrounding the 2011 Fukushima disaster, reactor containment systems cannot completely stop the release of radioactive material[11].

While any attack on a nuclear facility by saboteurs can disrupt facility operations for a protracted period of time, the target sets surrounding the three vulnerabilities mentioned above would cause the most significant damage to the facility, its personnel, and its surroundings. 10 CFR 73 draws a design basis threat (DBT) that outlines the general characteristics of adversaries that nuclear power plants must defend against in order to prevent radiological sabotage and theft of nuclear material. According to 10 CFR 73.1, facilities must prepare to defend against:

> " (i) A determined violent external assault, attack by stealth, or deceptive actions, including diversionary actions, by an adversary force capable of operating in each of the following modes: A single group attaching through one entry point, multiple groups attacking through multiple entry points, a combination of one or more groups and one or more individuals attacking through multiple entry points, or individuals attacking through separate entry points, with the following attributes, assistance and equipment:
>
> (A) Well-trained (including military and skills) and dedicated individuals, **willing to kill or be killed, with sufficient knowledge to identify specific equipment or locations** necessary for a successful attack;
>
> (B) Active (e.g., facilitate entrance and exit, disable alarms and communications, participate in violent attack) or passive (e.g., provide information), or both, **knowledgeable inside assistance**;
>
> (C) Suitable weapons, including handheld automatic weapons, equipped with silencers and having effective long range accuracy;
>
> (D) Hand-carried equipment, including incapacitating agents and explosives for use as tools of entry or for otherwise destroying reactor, facility, transporter, or container integrity or features of the safe-guards system;
>
> (E) Land and water vehicles, which could be used for transporting personnel and their hand-carried equipment; and
>
> (ii) An internal threat; and
>
> (iii) A land vehicle bomb assault, which may be coordinated with an external assault; and
>
> (iv) A waterborne vehicle bomb assault, which may be coordinated with an external assault; and
>
> (v) A cyber-attack."[12-13]

Deliberate plane crashes, which can be conducted by terrorists, as well as attacks through more complex weaponry such as missiles, which can be conducted by states, are not included in the DBT quoted above, because, according to U.S. legislation, it is the duty of the state, not the operating company, to account for these types of attacks. Still, the 9/11 attacks have compelled the U.S. regulator to issue an order on 25 February 2002[14], which – particularly its B5b section – outlined security measures for NPP licensees to develop in order to "maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire"[15]. Furthermore the industry has adopted its own "FLEX" approach after the 2011 Fukushima disaster, which aims to "maintain safety even after a catastrophic event by stationing emergency equipment in secure offsite locations"[16]. Hence the U.S. response so far, at least on the industry side, has focused on lowering the potential damage of deliberate attacks (such as airplane crashes) and strengthening emergency response measures rather than preventive measures such as enacting no-fly zones over NPP sites.

Likewise, Generation III Pressurized Water Reactors such as the ATMEA1 units that are expected to be constructed in Sinop and the VVER 1200 units that are planned for Akkuyu are designed to withstand large passenger plane crashes by employing methods like positioning emergency diesel power plants and pump stations for cooling water on opposite sides of the reactor building.[17] It is argued that Generation III NPPs, such as the VVER 1200, are also equipped with additional design features, such as the physical separation of redundant systems and subsystems, safety systems that can even be used in cases of elongated loss of all AC power, the capability to contain a molten reactor core without significant radioactive releases, and advanced approaches to fire protection.[18]

Nonetheless, adversaries can employ the means listed above, among others, in a successive fashion and inflict considerable damage to NPPs.

A successful defense against adversaries must include three major components. The first is detection, which aims to spot and track an imminent or incipient attack and "sound the alarms" by employing measures such as CCTV cameras, sensors, perimeter watch guards, and alarm communication systems. The second phase is delay, which seeks to slow the adversary's progress, giving response teams time to assess the situation, call for back up if necessary, create the conditions for an ideal interception (such as reaching a pre-determined secure interruption point), and thus increase the chances of neutralizing the threat. Some examples of delay elements are physical barriers, such as fences, razor wires, bullet resistant enclosures, and vehicle barriers. The final phase is response, which strives to address the threat according to plans based on a DBT and site-specific vulnerabilities as well as on multiple scenarios of adversary action. When planning a response, the responding forces must determine a critical interruption point (CIP), i.e. a "protected location or the location of remotely operated delay and denial systems that provides tactical and strategic advantage to the responding protective force to protect one or more targets."[19]

Knowledgeable and experienced adversaries would try to elude detection as long as possible, shorten the delay time, and seek countermeasures to overcome response measures. To conduct a successful sabotage, adversaries might use deceptive methods, such as creating diversions, turning off alarm systems, and would try to avoid detection by the intelligence agencies of the country before they commit the attack. Cyber-attacks and insiders can be used prior to an attack in order to shut down detection equipment and alarm systems. Adversaries that

are knowledgeable about the facility's interior and its security measures might not always choose the shortest path to their targets but prefer paths that give them a tactical advantage by minimizing detection or allowing them to circumvent the CIP.[20] Capable adversaries would likely consist of multiple attackers striking from multiple pathways, using various means of force successively – for example shutting down alarm systems with or without the help of an insider, taking out perimeter guards from a distance, using car bombs to breach the perimeter, so on and so forth. If adversaries have information on the routines of off-site security assistance – such as the routes that security forces take to reinforce on-site facility security – they could inhibit off-site assistance from reaching the facility during the sabotage. It is therefore of utmost importance that every critical defensive component in the facility and the communications between on-site security personnel and off-site security personnel are designed in such a way such that they cannot be taken out with a single adversary action.

The preliminary safety assessment reports (PSAR), which contain detailed information regarding the safety and security designs of the NPPs in Akkuyu and Sinop, have yet to be submitted to Turkish authorities. However, some technical information regarding the planned safety measures can be deduced from the Environmental Impact Assessment (EIA) report of Akkuyu.[21] The report suggests that a security in-depth approach is planned to be included in the design. These include designing autonomous auxiliary systems for each facility operation to ensure that a single adversarial action cannot take out communication and detection systems, reliance on passive security systems in core excess heat and emergency cooling systems, the physical separation of security equipment from one another against fire, flooding, steaming, missiles, and NPP pipe systems[22]. Furthermore, the EIA suggests that emergency power source systems are designed to run for 72 hours on autonomous charge and up to 10 days if refueled[23], thus giving responders come breathing room to coordinate and execute their responses in case of an emergency.

With regards to plane crashes, the Akkuyu EIA suggests that Turkish authorities will allow the movement of air corridors outside the Akkuyu site. While the possibility of a 20-ton aircraft (the EIA gives the example of a Phantom RF-4E) crashing into the NPPs is included in the design of the facility, crashes of large commercial aircraft are considered beyond design basis events (DBE).[24] However, the report also suggests that preconditions imposed by the Turkish Atomic Energy Authority (TAEK) require that small aircraft, military aircraft, and large commercial aircraft crashes are to be specifically considered, and that studies in this area are being conducted[25] - it is expected that more information in this regard will be released in the PSAR. Moreover, a recommendation letter by the Ministry of National Defense quoted in the EIA suggests that the area in which Akkuyu will be built on will be added amongst prioritized air and missile defense zones[26]. According to the EIA, the fresh fuel storage facility, spent fuel storage facility, and pumping stations will be designed in a manner that takes aircraft crashes into account.

In addition to sabotage, adversaries could target radioactive fuel and waste in transit. While the issue will be discussed in more depth in the section below, it should be noted that adversaries can inflict major human, environmental, and economic costs if they target nuclear material being transported through population centers or areas of strategic significance, such as ports and airports. One such target is the Bosporus Strait, which may be used to transport nuclear fuel and waste to the prospective NPPs. Istanbul hosts one-sixth of the country's population and provides one-quarter of the country's GDP.[27] On average, around 140 vessels

pass through the Bosporus daily, while more than 2,500 ships ferry passengers between the European and Asian sides of the city.[28] Although radioactive leakage from an accident can negatively impact the city's residents, environment, and economy, a deliberate attack designed to be as damaging as possible can be far more destructive, hence Turkish authorities need to take credible precautions for such a scenario. The EIA unfortunately argues that the Bosporus issue is beyond its scope and only refers to existing practices and international agreements regarding the transit of sensitive material from the Bosporus[29]. In addition to the aforementioned PSAR, the project company also needs an emergency response plan (ERP) as a prerequisite to begin operating the facility. The ERP will be prepared by an authority sanctioned by the Ministry of Environment and Urban Planning Ministry[30]. According to the project, natural disasters, accidents and sabotage are all considered accidents. Furthermore, since the project site is a "Sensitive Area" according to Law No.7126 on Civil Defense, Natural Disaster and Emergency, Civil Defense, Sabotage, War, Damage Repair and National Alarm plans must be drafted and submitted to Mersin Governorship City Disaster and Emergency Management Directorate for approval[31].

Theft or Diversion of Sensitive and Critical Radioactive Material

According to the Argonne National Laboratory at the University of Chicago, nine radioactive isotopes can potentially be used to make dirty bombs.[32] These isotopes are: americium-241, californium-252, cesium-137, cobalt-60, iridium-192, plutonium-238, polonium-210, radium-226, and strontium-90. The IAEA adds highly enriched uranium, uranium-233, thorium, and other plutonium isotopes to the list of substances that require specific safety and security measures,[33] and the US NRC includes un-irradiated mixed oxide fuel (MOX).[34] NPPs commonly rely on uranium as fuel, while plutonium, MOX and thorium may also be used, and produced as waste, whereas highly radioactive materials such as cesium-137 and cobalt-60 are also produced as a result of the fuel cycle. A study by Ferguson et al that looks at the usability of a radioactive substance, based on its half-life, portability, and prevalence, to achieve violent ends suggests that cobalt-60, cesium-137, iridium-192, and strontium-90 "could possibly end up in the hands of terrorists and cause great risk to the public."[35]

Whether terrorists can find the necessary equipment and radioactive material in large amounts, let alone assemble or use improvised nuclear devices successfully, is a source of debate among academic and scientific circles and is beyond the scope of this article. Radiological dispersion devices (RDD) – or dirty bombs –may be within the technical reach of terrorist and criminal organizations, yet the issue of extracting, storing and handling nuclear and radioactive material would still be an arduous task beyond the capabilities of most terror organizations. Still even if we assume that the probability of such an attack is dim, the act alone would be enough to cause panic, erode confidence in security forces, and raise questions about the country's nuclear program if the public found out that terrorists managed to infiltrate and steal radiological material from a nuclear site. Therefore, the theft or diversion of critical radioactive material is a threat in itself irrespective of whether or not terrorist organizations may or would use RDDs in terror attacks.

The precautions against theft or diversion overlap in many ways with the precautions for stopping radiological sabotage but there are some differences. One difference is the need for adversaries to leave the facility after the theft, which

means they need both entry and exit pathways.[36] Conversely, saboteurs may be willing to die in order to accomplish their mission or conduct their operations remotely, thus do not necessarily need exit pathways. Furthermore, even though this is also an issue for radiological sabotage, the DBT regarding theft or diversion of radiological material should put an added emphasis on the susceptibilities of radioactive fuel and waste in transit, in other words when they are most vulnerable to attacks. Radiological material can be transported by land, sea, or air. Historically, the latter has been the least preferred mode of transportation due to the safety risks involved but may at times be the preferred mode of transport when factoring in security and time concerns. The analysis in this paper will focus on the security of transports through land when they are arriving on or leaving Turkish soil – that is, between the nuclear facility and the land border, port, or airfield – since it is the most likely route for terrorists or criminal organizations to strike the cargo. At the time of writing, it was unclear how the plant operators would transport fuel, waste, and other critical materials to the Sinop NPP. Therefore, the preliminary analysis here is based on hypothetically likely logistical alternatives and topography.

According to an article on the Akkuyu NPP JSC webpage, authorities are planning to transport the fuel for the plant[37] and the resulting waste by sea, necessitating the use of sea ports. There are three ports within a 150 kilometer (~90 miles) radius of the Akkuyu NPP site: Yeşilovacık (approximately 15 km away), Silifke-Taşucu (~30 km), and Mersin (~140 km). The port of Yeşilovacık is currently under construction and is planned to be used in the transportation of materials to the three thermal power plants and two cement factories in the area. The port of Taşucu is planned to be used as a mounting and construction site for the NPP in Akkuyu,[38] with roughly 52 ships using the port during the construction phase of the NPP.[39] Two additional wharfs are also scheduled to be built within the NPP site in order to aid the construction load and carry nuclear fuel.[40] Entry to these two ports and to the coves in the vicinity of the facility site by third parties (such as fishing and touristic ships) will be barred.[41] During the operating phase, one ship for each of the four reactors is expected to carry nuclear fuel to the NPP annually.[42-43] The project company plans to transfer 80 percent of the equipment and material to the facility directly through the sea route, whereas the remaining 20 percent are expected to be transferred through land – though all of the nuclear fuel and waste transfers will be conducted via the on-site wharf complex.[44] The project company has two main alternatives for land transfers.

There are currently no railroads connecting the Port of Mersin or the other two ports to the Akkuyu site. The area is mountainous, making the construction of railroads costly and lengthy. Therefore, radioactive material could be transferred by trucks after reaching one of the ports or airports in the area.[45] In any scenario, there are two roads that trucks could take to reach the planned NPP. The first is the D-400 state road that passes through most of Turkey's Mediterranean coast, which, for the most part, is a dangerous, curvy, two-lane road in the cliffs of the Taurus Mountains. In its current state, the transport of critical nuclear material on that road, even without a terrorist threat, is very dangerous. The alternative road is the Mediterranean Coastal Road project, which is expected to be completed in early 2015.[46] After the construction of dozens of tunnels and viaducts, the new road will pass through the mountains and significantly shorten the distance of travel. For logistical purposes, the second road could be preferable to the former, but the number of viaducts and tunnels, which may be used as interception points by potential adversaries, would also presents a serious security challenge. The plan

Figure 1: Akkuyu NPP Project site and proximate ports

outlined in the Akkuyu EIA suggested that fuel shipments arriving at ports located within the facility site shall be transferred by trucks to the NPP, significantly lowering the risk of interception.[47] In this plan, the bulk of construction materials would be transferred through the Mersin-Antalya highway, a part of the Mediterranean Coastal Road project. The project company also plans to develop the roads to augment the connections of the NPP site to surrounding towns and highways.

The NPP in Sinop is planned to be built at Abalı, roughly 10 km away from the airport and 18 km away from the city center and the port of Sinop. Though there are smaller ports within a 100-km (60 mile) radius, the closest major port is the Port of Samsun, one of Turkey's largest ports, which is roughly 175 km away (~105 miles). While Samsun has railroad connections to central parts of the country, there is no railroad access to Sinop. The D-010 state road runs through the Black Sea shore and is the main route that connects Abalı to Sinop, Samsun, and other cities littoral to the Black Sea. This road offers more favorable conditions compared to the D-400 as a result of more investments in the last decade. The sections of the road between Abalı and Sinop and Sinop and Samsun are less hilly, and therefore offer fewer potential choke points for adversaries. Currently, the terms that the project company and the government will ultimately agree upon is far from certain, but both sides may choose to build additional ports within the Sinop NPP facility site, like in the Akkuyu case, for logistical and security reasons.

There is also the possibility of building a fuel rod production facility in Turkey. According to Turkish news reports, Turkey hopes to add this issue to the Host Country Agreement that will be signed with Japan.[48] According to the Minister of Energy and Natural Resources, Taner Yıldız, Turkey still plans to import nuclear fuel but will produce its own fuel rods and load its own fuel pellets into the rods for both NPPs in the said facility.[49] It is currently unclear where this facility will be located but similar DBT analyses will have to be made for the prospective fuel rod production facility and the transfer of sensitive radioactive material between the facility and NPPs.

In late 2013, the land that Akkuyu was to be constructed on was declared a special security zone. It is likely that the Sinop NPP will be given a similar status. Due to this status:

> "no man, excluding the staff of the facility, officers of the competent command and persons that got the appropriate permit, can stay, live in security zones and in the maritime space, where the special zone is also established. Any technical works at the distance of four hundred meters from external borders of the terminal facilities of the nuclear power plant shall be performed after agreement by the competent authorities of the corresponding ministries and agencies with the competent bodies of NPP. It shall be prohibited to manufacture, store, transport combustible and explosive materials at the distance of up to two hundred meters from external borders of the security zones of the plant."[50]

Reportedly, as part of the detection system, Turkish authorities will also continuously monitor all roads leading to the Akkuyu NPP and the nearest town of Gülnar.[51] The system includes 12 cameras in total, 4 for vehicle and plate number recognition and 8 for visual tracking. They will include auxiliary power systems and keep records for at least one month. The system will be run from the gendarmerie headquarters in Gülnar and will be integrated into gendarmerie databases. Security personnel at the Akkuyu NPP will be able to monitor the visual tracking system through an additional server linked to the main system at gendarmerie headquarters.

While these measures are necessary steps towards ensuring the security of the facility from external threats, Turkish and Russian authorities should also take note of threats that may arise from within.

The Insider Threat and Sensitive Information

Having information on the transfer of radioactive materials and sensitive technologies –such as the route, security precautions, and schedules – would significantly increase the chances of an adversary's success. One way to gather such information is through the help of an insider.

Likewise an insider can aid saboteurs by shutting down alarm and camera systems, creating distractions, and providing information about the floor plans and security measures of the facility. Insiders who have access to computer systems can turn off firewalls to enable cyber-attacks or can insert malicious software into the computers through discs or flash drives. Insiders could sabotage the facilities themselves or facilitate the process by taking out security guards. The majority of previously recorded incidents of nuclear theft or attempted diversions included the active or passive participation of insiders, whether they were planted operatives or simply opportunistic employees looking to make a profit. In one example from 1995, 1.7 kg of 21 percent enriched uranium was smuggled out of a Russian nuclear fuel plant "in a shopping bag full of apples" by an employee at a time when portal monitors were shut down.[52] As for nuclear sabotage, the most serious known incident to date was in 1982 in South Africa, when an insider hired during the construction phase of a facility detonated explosives placed directly on reactor heads, another target in the containment building, and a concentration of electric cabling under the main control room[53].

The Turkish National Intelligence Agency (MIT) will reportedly vet and perform background checks on all 12,000 (4,000 Russian and 8,000 Turkish) Akkuyu NPP employees, including interns and contractors.[54] In a 2006 study, Lee argued that "just five well-placed insiders may be sufficient to carry off a successful theft, even in Russian enterprises equipped with the most advanced U.S. safeguards."[55]Furthermore, according to Zaitseva and Hand, in all known cases of weapons-usable radioactive material theft involving insiders, the insiders were low-key personnel.[56] Employees working for the facility or private contractors building and operating the facility and its numerous functions can be "turned," or bribed, long after the vetting process is complete. This means that MIT and other security apparatuses of the state must be vigilant at all times. As Bunn and Sagan argue, background checks are not usually very effective, and even the most trustworthy employees can become insiders, "especially if they are coerced."[57]

Insiders do not necessarily need to participate in the attacks but may pose similar threats to the security of NPPs by sharing critical information. 10 CFR 73.22 outlines specific requirements for the protection of safeguards information, which includes: the physical security plan of the site; site-specific maps, sketches or drawings; alarm system layouts; emergency power sources; physical security orders and procedures; security communications systems; passwords and lock combinations; contingency plans; details on on-site and off-site response forces; schedules for the shipment of materials; and information about security precautions and inspection reports among others.[58]

According to the Akkuyu EIA, more than 12,500 construction personnel will be employed during the construction of the facility.[59]As can be seen on the table below

(originally provided in the Akkuyu EIA[60]), this number is expected to peak in 2019, right before the first reactor goes online, and gradually fall until the construction of all four reactors is completed which is planned to be in 2023 – though there remains the possibility that this schedule will not be met. During this time frame, the operators plan to complete and activate one reactor every year, each requiring 1,000 personnel to operate.

Table 1: The Cumulative Number of Personnel Throughout the Start-up of Reactors in Akkuyu

Year	Project Phase	Construction Personnel	Operation Personnel	Total
2018	Construction	12,579	-	12,579
2019	Construction	12,584	-	12,584
2020	Construction/Operation	10,886	1,000	11,886
2021	Construction/Operation	9,090	2,000	11,090
2022	Construction/Operation	6,138	3,000	9,138
2023	Operation	-	4,000	4,000

Even though a gradually decreasing number of people will be occupying the facility site after the peak in 2019, the NPPs are especially vulnerable during the years between 2020 and 2023 to the insider threat, among other threats mentioned above, for several reasons. Before the plants go online, potential saboteurs and/or culprits of diversion only have the ability to access several sensitive technologies and materials involved in the operation of the facility – nuclear fuel, among other radioactive materials, is not present – so the risk is minimal. After the facilities go online one by one, however, the window of opportunity for an adversary increases considerably. Selecting, screening, and monitoring 4,000 personnel to operate the plant (1,000 for each reactor) would be a demanding but viable task, whereas doing the same for thousands of construction personnel would be far more challenging – granted, the main threat that the construction personnel poses would be more related to their physical access to sensitive equipment and materials rather than their access to information. This is further complicated by additional factors, for example construction is usually undertaken by multiple contractors, which may occasionally replace workers throughout the construction phase. Some other factors are: the volume of sea and land traffic which will be considerably higher than required for solely operating the facilities, the clutter of conducting both operations at the same time, and the need for newly hired security personnel and installed systems to be tested and prepared before achieving full capacity. These complexities may create vulnerabilities that potential adversaries and insiders could be interested in exploiting. The project company has stated that it plans to restrict the access of construction personnel to units that have begun operation in order to ameliorate these challenges. According to the EIA as they become operational, the units will be turned into controlled access areas and will be protected with physical security measures in line with IAEA regulations[61].

One other threat is that terrorist organizations may adopt violent measures to extract critical information regarding nuclear technology from nuclear scientists employed at the facilities. For example, information obtained from nuclear scientists regarding the safety and transportation of sensitive radioactive material can be used by terrorists to aid their attempts to create an RDD in the future. To accomplish this, terrorist or criminal organizations may resort to means that indirectly threaten nuclear security, such as kidnapping, blackmail,

and intimidation. Furthermore, terrorists may attempt to kill high-level facility employees and nuclear scientists in order to disrupt the operations of an NPP. Hence, in addition to taking the necessary steps to ensure the safety of facility personnel, security forces, and related authorities in the government, security measures must ensure that sensitive information on the matter, such as the identities of facility employees (especially those that have access to sensitive technologies), scientist profiles, security protocols, and, where applicable, schedules and routes of busses that high-level employees use to commute to work each day, must remain outside the reach of terrorist and criminal organizations.

Cyber-Security

While cyber-attacks are beyond the scope of this article which focuses on physical security, it is worth noting that cyber-attacks can be utilized in conducting hybrid attacks. Cyber-attacks may be used to disable or disrupt the safety, security, and emergency preparedness functions of the NPP as well as supporting systems and equipment. According to the IAEA Reference Manual on Computer Security at Nuclear Facilities,[62] cyber-attacks on nuclear facilities may lead to:

- *Unauthorized access to information (loss of confidentiality)*
- *Interception and change of information, software, hardware, etc. (loss of integrity)*
- *Blockage of data transmission lines and/or shutdown of systems (loss of availability)*
- *Unauthorized intrusion into data communication systems or computers (loss of reliability).*

The IAEA guide serves as a valuable resource in establishing the cyber DBTs of NPPs, which may vary from the DBT concerning the physical security of the NPP. It is important to note that cyber space is an area in which offensive measures currently have the advantage, the rules of the game are not clearly defined and defensive and offensive cyber capabilities are constantly developing. Authorities should bear in mind that since systems can be tampered with on the hardware level and result in the loss of confidentiality, integrity, availability, and reliability outlined above, cyber-security begins even before the operators of the facilities press the power button.

STATE-LED THREATS

As touched upon in the introduction, by building nuclear power plants and diversifying energy resources, Ankara needs to review its threat calculations and strategic assets categorization. From a military standpoint, once established, the planned nuclear power plants will constitute high-value targets for foreign armed aggression.

In conventional terms, Ankara enjoys military superiority against its potential competitors. The Turkish Air Force remains one of the major operators of the F-16s. Ankara is not only capable of maintaining air superiority over Turkey but also has been garnering deep-strike capabilities through the acquisition of tanker aircraft, effective reconnaissance systems, and advanced air-to-air and air-ground missiles. Such assets and concepts enable the Turkish Air Force to gain robust punitive strike capabilities that promote deterrence. Furthermore, Turkey is modernizing its air wing with the purchase of some 100 F-35s in the coming years.[63] The army has been undergoing a major procurement program with high-end systems such as *Altay* Main Battle Tank, Firtina *(Storm)* 155mm Self-Propelled Artillery, T-129 Attack Helicopter, and Ch-47 heavy-lift helicopters.[64] Also, the navy enjoys conventional superiority when compared to most of the eastern Mediterranean coastal states. Thus, given the military strategic balance and political landscape, we do not expect a land incursion, naval or amphibious operation, or an air force threat to Turkey's planned nuclear energy infrastructure.

However, the proliferation of ballistic missiles on Turkey's doorstep coupled with regional tensions could constitute a significant military threat to the planned nuclear energy infrastructure. First, because ballistic missiles can be deployed without land incursion or troop concentrations in border areas, they could render Turkey's conventional superiorities abortive. Second, Turkey lacks ballistic missile defense capabilities on its own and is still working on a tender, the T-Loramids, to close this gap. Third, a relatively short period of forewarning and lack of early signs of a ballistic missile attack could catch Ankara off guard with respect to protecting its planned critical energy infrastructure.

Ballistic Missile Threat to Turkey's Future Nuclear Energy Infrastructure

Turkey borders the Middle East, a region that has witnessed immense ballistic missile proliferation for decades. Moreover, Ankara's two neighbors, Iran and Syria, are notorious for their ballistic missile arsenals that could potentially pose a threat to the Turkish nuclear power plants.

By reducing energy dependency and raising Turkey's energy portfolio to a new level, the nuclear power plants could be seen as high-value strategic targets to Ankara's competitors. The political-military landscape in Syria and Iraq has placed Tehran and its ally the Baathist regime of Damascus in a rivalry with Ankara's regional leadership aspirations.

In a future military escalation scenario, Iran's and Syria's potential to pose a threat on Turkey's nuclear power plants would depend on several parameters including range, mobility, numerical advantage, warhead choice, accuracy, and Ankara's

projected missile defense capabilities, which are analyzed below. In addition, as all military operations take place within a political context, Damascus' and Tehran's political motivations for such an attack would also be of importance. As indicated earlier, by establishing nuclear power plants, Ankara is also building high-value targets in terms of critical national infrastructure. Thus, it would be accurate to focus on potential state-led threats through a capability-oriented approach as follows:

Range, Systems, and Warheads

While Syria's current ballistic missile range would be adequate to target Akkuyu through Scud variants *(B,C, and a limited number of longer range D variants)*, Iran's missile arsenal is capable of striking anywhere in Turkey, including the second plant that is planned to be built in the city of Sinop in the Black Sea Region.

Yet, for the Baathist regime of Syria – if such a regime is to exist when Turkey's nuclear energy project materializes –the only way to target Sinop would be by launching the longest range Scud-D missiles (with an estimated range of about 700 km, depending on the warhead choice) from the very border areas that the Assad regime cannot control at the time of writing. According to the IISS' *Military Balance 2014*, the Baathist Regime's forces have the use of three surface-to-surface missile (SSM) brigades equipped with Scud variants, SS-21, M-600 *(*Syrian version of the *Iranian F-110 Fateh)*, and a FROG rocket system.[65] Interestingly enough, the *Military Balance 2014* stated that one of the SSM brigades fell under the 4th Armored Division's command.[66] Normally, a doctrinal order of battle would not place an SSM brigade under an armored division's subunits. Yet, the 4th Armored Division is one of the Baathist regime's praetorian units and has been intensively used during the ongoing civil war. Their doctrinal order shows the importance that the regime attaches to its strategic weapons.

In this regard, it is striking that the Assad regime's chemical deal with the West did not cover Syria's entire strategic weapons arsenal. If the regime survives the civil war, there is a strong possibility that it will keep its ballistic missile capabilities. Furthermore, the civil war has proven the will of the regime to use its missile arsenal in armed conflicts.

There are two caveats concerning the disarmament of Syria. First, there is the risk of leaving undeclared chemical agents and other capabilities at the hands of Assad. For a moment, Syria declared 23 sites, 41 facilities, and some 1,300 tons of chemical agents and precursors along with some 1,230 unfilled munitions. Yet, opposition sources claim that 20% of the total arsenal, the rest of which mainly consists of the deadly VX agent, remains undeclared, thereby untouched. Furthermore, biological weapons were not incorporated in the disarmament deal[67].

For this reason, simulating a Syrian ballistic missile attack against Turkey's planned NPPs changes in scenarios with WMDs and conventional warheads. As this paper will examine, conventional warheads accompanied by the Scud line's problematic CEPs would necessitate a ballistic missile salvo in hundreds. Yet, biological and chemical warheads can again alter the entire calculus. In other words, these two scenarios point to the difference between the possibility of the destruction of the nuclear energy facilities by conventional warheads, the contamination of nuclear energy facilities, and the terrorization of the public by biological and chemical warheads.

Studies on biological and chemical contamination suggest that 0.2 pounds of botulinum toxin or 0.02 pounds of anthrax spores can contaminate a one square-mile area, while 1,763 pounds of sarin nerve gas would create the same lethal effect.[68] Such an amount would cover two times the total size of the nuclear power plant area in Akkuyu and three times that of the core nuclear energy production area. On one hand, there are conflicting intelligence reports on the weaponization level of bio-toxins and bio-agents by the Baathist regime.[69] On the other hand, it is reasonable to assume that Assad could rely more on biological weapons research and development in order to close its strategic weapons gap following the chemical deal.

When it comes to Tehran's possible ballistic missile threat, the geographical distance rules out shorter range systems such as Shahab-1 and Shahab-2, which cannot cover the minimum necessary range of 850-900 km even if launched from the border regions of Iran. Therefore, this paper argues that, unlike Syria, Ankara should be concerned about the longer range missiles of Iran, of which the Shahab-3 enjoys a range of at least 800-1,300 km with a conventional payload of around 1,000kg.[70] This not only limits the type of missiles used but also hinders Tehran's numerical advantage in theater systems, such as Fateh-110 and Zelzal line. The Ghadir-1 Missile with a range of about 1,600 km and the new solid-propelled Sejjil Missile with over 2,000 km of range are Tehran's other options if it chooses to strike Turkey's planned critical energy infrastructure.[71] Additionally, unlike the Shahab-3, these two missile systems can reach Turkey's planned critical nuclear energy infrastructure from deep within Iranian territory. Yet, as noted above, the number of missiles would still be limited. For instance, as of 2013, CSIS reported that the total number of Ghadir-1 and Shahab-3 missiles was between 50-400and the number of Sejjil-2 missiles was much lower than previously estimated.[72]

Number of Missiles Required and Accuracy Problem

In a threat scenario with conventional warhead-tipped ballistic missiles targeting Turkey's planned critical nuclear energy infrastructure, the number of missile launches is crucial for two reasons. First, an overwhelming intensive missile strike could penetrate Ankara's future ballistic missile capabilities by saturating the projected BMD batteries. Second, Syria's and Iran's mainly Scud-based missile arsenals face the Scud line's chronic accuracy problem. Therefore, a number of missiles would be needed in order to cover an area of 75-125 hectares, the size of the planned nuclear production facilities and surroundings in Akkuyu respectively.

The accuracy of ballistic missiles is expressed in terms of *circular error probable (CEP),* which can be described as:

> *"…the radius of a circle within which half of the missiles land for a given aim point. This parameter works well for calculating the probability of kill or the number of weapons required to destroy a target. But a different description of missile error is needed to assess the impact of enhanced guidance systems, because several error sources affect the accuracy of missiles. And because the total guidance error is the square root of the sum of the squares of the individual errors, total system inaccuracy is determined to a great extent by the single largest error source. The three major categories of guidance error are errors in launch position accuracy, en route errors, and target-location errors."*[73]

Any state actor that plans to strike Turkey's planned nuclear power plant in Akkuyu would need to plan for a strike area covering a 125-hectare area that

includes all related facilities, such as cooling water pumps and the electricity infrastructure. Even a more concentrated approach would only reduce the target area to 75 hectares by targeting core nuclear energy production.[74] A RAND Corporation study evaluating air base vulnerability against missiles calculated the number of required missiles *(Scud-C sample: with a CEP of 2,394.4 feet and 241 feet lethal radius)* for about 95 hectares of a parking ramp to be 276.[75] Granted, there are structural differences between an airbase parking ramp with aircraft and shelters and a nuclear power plant. Still, we estimate that any state actor would need hundreds of ballistic missiles to strike Turkey's planned critical infrastructure with conventional warheads.

Road-Mobile Character and Fuel Trends

All of the Syrian and the majority of the Iranian ballistic missile arsenals are road-mobile.[76]This feature makes potential aggression against the Turkish critical energy infrastructure hard to detect. Moreover, solid fuel systems, like the Iranian Sejil-2, shorten the launch cycle considerably and make any preemptive strike option significantly harder.[77]

Road-mobile missiles can survive Turkish retaliation by constantly shifting transporter-erector-launchers (TELAR). Such a course could enable second-wave missile salvos to be launched onto the planned nuclear power plants.

Turkey's Planned Missile Defense and Protection for the Nuclear Power Plants

In response to these threats, Turkey has been running a missile defense project, the T-Loramids, since 2009. At the time of writing, Ankara is to decide between the Eurosam's Aster-30 Block-1, Raytheon-Lockheed Martin partnership's Patriot PAC-3, and the controversial Chinese HQ-9 system bid by the CPMIEC.

Regardless of these systems' differences, Turkey's future missile defense capabilities mean a number of things when thinking about the protection of the planned nuclear power plants.

The first issue is the missile-interceptor equation. Clearly, while Turkey's options for the T-Loramids project would be effective against tactical and short range ballistic missiles (SRBM) – such as the SS-21, Scud-B, and Scud-C in the hands of the Syrian Baathist Regime or the Shahab-1, Shahab-2, and other shorter range systems in the possession of the Iranians –longer range systems could go well beyond the T-Loramids bids' interception capabilities. For instance, given the MBDA reports for the Aster-30 Block-1, the system can intercept short range and theater ballistic missiles up to a 600km range.[78] Similarly, the Patriot PAC-3 system is reported to be capable of intercepting SRBMs and tactical ballistic missiles like the Shahab-1 and Shahab-2 while having "some capability" against longer range threats.[79] The Qatari and UAE efforts of procuring more advanced THAAD systems and the Israelis' Arrow program is clear evidence of the threat and interceptor gap with regard to longer range ballistic missiles and current point defenses. Thus, although Ankara's future missile defense options would provide a certain degree of protection for the planned critical nuclear energy infrastructure, assuming that the T-Loramids' decision phase will be finalized by 2014-2015, the project will still not be a silver bullet to all of the missiles that could pose a threat to Turkey.

Second, all the bids within the T-Loramids tender are suitable for point defense, which means they must be deployed in proximity to the nuclear power plants if Ankara wants to ensure their security. For instance, the Patriot PAC-3 can defend an area of 15-20 km,[80]the Aster-30 Block-1 can do more or less the same, and the HQ-is reported to have a range of 35km against ballistic missiles, albeit on paper.[81] Therefore, the deployment locations of the planned missile defense systems are as important as their acquisition.

Third, Ankara's choice of T-Loramids must fulfill the defense requirements against Scud-based systems, as these missiles are the main threat to Turkey's regional security. The Patriot line boasts the best combat-proven record compared to the other two bids. The Aster-30 Block-1 has successfully conducted interception tests against the Israeli *Black Sparrow* missile, which is currently the most suitable system to mimic Scuds in terms of range, speed, and radar cross-section.[82] While these successes could garner optimism, when it comes to longer range threats (mostly based on North Korean systems), such as the Scud-D in the Syrian inventory or the Iranian Shahab-3, further tests with more advanced simulations, such as with the Blue Sparrow, would be needed.[83]The forthcoming modifications of the Aster-30 line and the Aster-30 Block-1 NT could be suitable for Blue Sparrow tests.[84]However, even if Turkey goes for the initial Aster decision and a further upgrade for the Block-1 NT, ballistic missiles with a range over 1,000 km could still pose a threat.[85]Moreover, the Chinese HQ-9 system's tests are not as transparent as those of the other two competitors. Unlike the Patriot line, the Chinese system has never seen an actual combat situation. Therefore, should Turkey opt for the Chinese offer, the aforementioned uncertainties would bring about additional problems.

Turkey's missile defense capabilities must be viewed within the greater context of the NATO missile defense shield. The North Atlantic Alliance could boost its defensive capabilities through an integrated C4I2 *(command, control, communications, computers, information, and intelligence).* Within this framework, satellite-, ground-, and naval-based radars and sensors *(such as AN/TPY-2, Smart-L, AN/SPY-1)* in addition to exo-atmospheric *(i..e. the SM-3)* and endo-atmospheric *(i.e. Patriot PAC-3)* interceptors are used in a multi-layer conduct.[86] The key point of this missile defense approach is its integrated fashion, which enables an advanced cueing network, providing precise information about a hostile missile's trajectory and ensuring interception accuracy. The Aster and Patriot lines are the last layers of defense in this integrated NATO system. Thus, if Ankara ends up choosing the Chinese system, Turkey will not be able to integrate its missile defense assets with the NATO missile shield, seeing as how such an option has been strictly ruled out by the Allies.[87]

Finally, the timeline of both Turkey's national missile defense project and the NATO missile shield impacts the protection of the nuclear power plants. If Turkey decides on a system in 2014 or 2015, it will start receiving the first units in 2019 or 2020. This timetable suits the country's nuclear energy infrastructure because the power plants are scheduled to be operational around the same period.

The NATO missile shield schedule offers optimism in this regard. Notably, the first BMD-capable guided missile destroyer with the Aegis system and SM-3 interceptors was deployed in the Spanish naval base in Rota in early 2014. Four vessels are planned to be deployed to conduct regular patrols in the Mediterranean.[88]The deployment of ground-based systems in Romania and Poland is expected to be completed by 2015 and 2018 respectively, which would mark the third phase of the European Phased Adaptive Approach.[89]

Apart from the ballistic missile threat, cruise missiles should also be taken into account when considering the protection of Turkey's nuclear power plants. Theoretically, these systems are dangerous in two ways. First, land attack cruise missiles are unmanned aerial vehicles with accurate guidance systems, and they are more precise than ballistic missiles despite relatively smaller payloads in general. Second, their flight paths can stress defenses as cruise missiles are able to fly low altitudes, follow circuitous routes, hide behind terrain features, and approach a target from different directions.[90]Given the Turkish Air Force's superiority in air-to-air combat, an air-launched cruise missile threat could be handled for a prolonged period.

It is necessary to monitor defense economics trends in Turkey's security environment due to the fact that cruise missiles are expensive systems because of advance guidance and propulsion requirements. In theory, cruise missiles are used in the opening stage of a conflict to strike air defenses and high-risk targets.[91] Therefore, potential cruise missile threats to Turkey can be reviewed in conjunction with a ballistic missile threat scenario, in which cruise missile strikes to air and missile defense systems would be followed by ballistic missile salvos against critical infrastructure.

At this point, there are two main issues pertaining to the future cruise missile threat to Turkey's nuclear power plants. First, Syria and Iran could theoretically modify naval and anti-ship cruise missiles for land attack and WMD delivery.[92] Tehran recently declared the development of *Meshkat*, a new cruise missile with a 2,000km range.[93] Interestingly enough, in 2005, Tom Warner penned a story for the *Financial Times* about a secret arms transfer from Ukraine to Iran and China for Kh-55 cruise missiles.[94]If the reported *Meshkat* system is a Kh-55 modification, which it probably is, this development would bring a whole new set of concerns because the Kh-55 is a nuclear-capable delivery system.[95]

Both the Patriot system[96] and the Aster-30 Block-1[97]were reportedly able to intercept cruise missiles during tests. The Missile Threat indicates that the Chinese HQ-9 system also has cruise missile interception capabilities.[98] However, as noted earlier, cruise missiles are seriously problematic for missile defenses; therefore, actual combat results could differ from test results and technical aspects written on fact sheets.

On the subject of the cruise missile threat, another option is counterforce strategies. Instead of intercepting flying cruise missiles, their platforms, related facilities, and stocks are destroyed in a preventive fashion.[99] Such a military strategy would depend on deep-strike capacity, adequate intelligence, stand-off munitions, suitable platforms, SEAD *(suppression of enemy air defenses)* measures for operational security, and well-coordinated air-sea battle capabilities to cover potential naval platforms.

Turkey's counterforce capabilities are not currently at its best but its future is promising. First, the Turkish Air Force will be operating some 100 F-35 JSFs in the next few decades.[100]Second, since 2006, Ankara has maintained efforts to produce its national stand-off cruise missile, the SOM.[101] According to the Turkish Scientific and Technological Research Council (TÜBİTAK) and its Defense Industries Research and Development Institute (SAGE), the missile currently goes beyond a180km range, can avoid enemy air defenses, and will be integrated into the F-35 JSF.[102] Therefore, from a military standpoint, a platform-delivery means combination of F-35 and SOM would be amply capable of targeting enemy C2, ground facilities, surface vessels, aircraft shelters, and missile storage facilities

from long distances. Third, the Turkish Air Force has a tanker squadron of KC-135Rs,[103]which are capable of fueling fighter aircraft in the air in order to boost deep-strike options and on-station times. Moreover, Turkey is currently in the process of procuring ten A400M heavy airlifters. The acquisition will be completed until 2018. Although primarily used as a heavy transport asset, Airbus reports that the A400M can be rapidly configured to serve as a tanker aircraft.[104] Finally, in order to augment operational security, Turkey possesses a SEAD squadron *(the 151st)*[105]armed with AGM-88 anti-radiation missiles.[106]

In sum, Turkey has to rely on the NATO missile shield and the T-Loramids project in order to defend its NPPs against ballistic missiles. The country must also combine offensive and defensive systems to confront the currently less menacing cruise missile threat. On the bright side, the timeline of the T-Loramids, the Turkish Air Force's modernization, and the NATO allied missile defense initiative correlate with the roadmap for Turkey's nuclear energy project's security requirements. However, Turkey cannot solely rely on national assets when confronting medium-range ballistic missiles and WMD-tipped threats and thereby, Ankara would still need NATO protection. The T-Loramids would not be an end for Turkey but a beginning. Future long range air and missile defense systems would need further upgrades in accordance with missile proliferation trends. If the T-Loramids project joins hands with the Chinese, Ankara would lose NATO cueing and the protection of a layered approach.

Military Risk Assessment Key Takeaways

To sum up, ballistic missiles could change the military risk assessment regarding the security of Turkey's planned nuclear power plants. Introducing a game-changer in energy geopolitics is tantamount to setting a high value military target for Ankara's geopolitical rivals in the case of an armed escalation. Needless to mention, including a military risk assessment within the framework of nuclear power plant security does not strictly mean that there will be a high probability of war with Iran or Syria. Yet, it would be unwise to turn a blind eye to the escalation between Turkey and Syria, which has brought about the downing of a Turkish F-4 fighter aircraft, a Syrian Mig-23, and a Mi-17 helicopter. Artillery fire exchange along the Turkish-Syrian border areas has become a common trend. Therefore, although a major military offensive against Turkey's planned critical nuclear energy infrastructure is not likely, given the state of the turbulent regional conjuncture, it cannot be overlooked.

PROXIES AND TERRORISM RISK ASSESSMENT

While the military risk assessments of state-led threats presented in this paper focus on rather unlikely possibilities, the threats of terrorism and proxy war to Turkey's planned nuclear energy infrastructure are seen as more probable. First, terrorism and proxy wars have become regular codes of conduct for most state actors in the Middle East. Second, terrorism and proxy war are relatively cost-effective ways of bleeding geopolitical competitors compared to direct aggression. Third and last, there are many terrorist organizations and violent non-state actors in and around Turkey's hinterland that could offer their services to several state clients depending on shifts in the political conjuncture. These actors stray from Turkey's list of usual suspects like the PKK and include emerging threats like the Islamic State of Iraq and the Levant (ISIL).

Furthermore, terror organizations themselves could be interested in attacking Turkey's future nuclear infrastructure. Nuclear power plants are valuable targets for terror organizations due to the highly destructive physical, economic, political, and mental impact that would ensue in the case of a successful attack. A terrorist organization might be interested in expanding its arsenal by obtaining nuclear and radioactive materials as well as sensitive technology from these facilities. Threats to nuclear power plants are not limited to attempts to trigger complete meltdowns. Terrorist organizations may not attempt to cross that threshold but may choose to focus on nuclear material in transit, target the electrical grid, assassinate nuclear scientists and employ numerous other measures to damage the facility and its operations. Turkey has suffered decades of violence from dozens of domestic and international terror organizations, which means there are a number of potential culprits who might be willing to attack Turkey's prospective nuclear energy program. The next section outlines the main terror organizations that are currently operating in Turkey or are sleeping, but may resume violence in the years to come. Though they can fit more than one description, terror organizations currently operating in Turkey can be grouped into three main categories: separatists, religious fundamentalists, and the radical left-wing.[107]

The following sections will give a *tour d'horizon* on several terrorist organizations that could pose a threat to Turkey's nuclear power plants in the 2020s.

Separatist Terror Organizations

PKK/KONGRA-GEL

Brief History

The Kurdistan Workers' Party (Partiya Karkeren Kurdistan, PKK) is the most notorious terror organization in Turkey. The organization was founded in 1978 in the southeastern Turkish city of Diyarbakır under the leadership of Abdullah Öcalan. The organization's original founding premise was the establishment of an independent Kurdish state in the heavily Kurdish-populated areas of Turkey, Iraq, Iran, and Syria. It has been influenced by Marxism, Leninism, Maoism, and Kurdish nationalism. In its first violent act, the organization conducted a raid on a parliamentarian's residence in 1979, and then moved to Syria, Lebanon, and Palestine to train for its terrorist campaign.[108] The PKK's terror activities intensified after 1984 and the conflict between Turkey and the PKK has claimed more than 40,000 deaths.

The organization draws manpower mostly from marginalized Kurds in Turkey, radical left-wing groups that operate in the region, and militant ethnic Kurds living in Syria, Iran, and Iraq. Especially during 1980s and 1990s, the Turkish state's cultural and physical repression of Kurdish identity, sometimes amounting to indiscriminate violence, helped the organization fill its ranks. The captures of the PKK's leader Abdullah Öcalan in February 1999 and second-in-command Şemdin Sakık in April 1998 seriously hampered the PKK's strength. After a five-year hiatus, the PKK resumed terror operations in 2004. As a result of peace negotiations between Ankara and Öcalan in 2012, the PKK declared a ceasefire in March 2013 but has recently threatened to resume violence.

Mode and Pattern of Conflict

The PKK resorted to different modes of violence throughout its operational history, including but not limited to: kidnappings, raids, irregular warfare, suicide bombings, sabotage, ambushes, arson, violent protests in urban centers, and direct clashes with security forces. The PKK has utilized these modes of violence with the following goals in mind: to oppress or gain sympathy of the local Kurdish populace, destabilize government rule, force migration, gain territorial control of rural areas, inflict material costs to the government, invoke terror among the populace in major cities and throughout eastern and southeastern Turkey, and establish an autonomous Kurdish state. To meet these ends, the PKK has targeted government officials, bureaucrats, security forces, and local populations in urban centers and in areas of its activity. In numerous instances, the PKK sabotaged and raided energy infrastructure using a variety of weapons, including bombs, explosives, IEDs, and rocket propelled grenades.

In 2013, the PKK declared twelve regions of operation in which it aspired to establish an autonomous Kurdish state. In addition to eastern and southeastern Turkey, these regions span parts of central, northern, and southern Turkey. Historically, most of the PKK's activities covered the heavily Kurdish-populated parts of eastern, particularly southeastern, Turkey, but the organization also made an effort to increase its area of operation by branching out to parts of central Turkey, the Black Sea, and the Mediterranean coast. By expanding its reach, the

PKK attempted to show its ability to operate in all parts of the country, demoralize government security forces, and stretch security forces thin.[109]As a show of force, the PKK targeted major cities outside of their usual scope, such as the urban centers of Istanbul, Ankara, and Izmir.

PKK activity in Sinop has been minimal, but the organization has conducted some operations in bordering cities in an attempt to extend its reach to eastern parts of the Black Sea region. If the organization decided to conduct a large-scale operation in Sinop, it could draw manpower from Tunceli (also called Dersim) and other cities where it has been traditionally active. This type of activity, however, has a high chance of being detected by government intelligence and security forces.

Mersin, on the other hand, would be a considerable challenge for the government. In the past, the PKK conducted major activities in Mersin, Hatay, Adana, and other nearby provinces. The area is close to southeastern Turkish cities where the PKK has been operating for over three decades. Located near northern Syria, southeastern Turkey is where the PKK previously established safe havens and training camps and where the PYD - an ideological affiliate of PKK –recently declared autonomy. The region's rough terrain is conducive to PKK activity because the rural wing of the organization prefers mountainous, hilly terrain in eastern and southeastern Turkey. The PKK also has task forces for urban terror activities in the area.

Domestic and International Collaborators

The PKK has continued to receive logistical and material support from Syria and Iran,[110] the level of which fluctuates depending on the political context. Additionally, they have used the mountainous territory in northern Iraq as a safe haven and training ground. The organization has also financially benefited from smuggling activities along Turkey's borders with Syria, Iran, and Iraq. Moreover, drug trafficking and money laundering in Europe also serves as a major source of income.[111] Internationally, through the active participation of the Kurdish diaspora and the establishment of media outlets, the PKK has mustered some level of political support in Europe.[112]

The PKK has also cooperated with radical left-wing organizations operating in Turkey before, such as the DHKP/C (Revolutionary People's Liberation Party-Front) and TİKKO (Liberation Army of the Workers and Peasants of Turkey),[113]and allegedly even with radical right-wing organizations such as the İBDA-C (Great Eastern Islamic Raiders' Front).[114] While alliances have shifted at times, these organizations have a history of collaborating with the PKK in conducting joint operations[115] and receiving joint training.[116] The PKK has cooperated with other domestic and international separatist organizations as well, including ASALA (Armenian Secret Army for the Liberation of Armenia),[117] which has not posed a significant threat to Turkey since mid-1980s.

Current Operational Strength and State

Although there have been minor incidents, the PKK has not conducted any major operations over the last year as a result of the ongoing peace negotiations between the Turkish government and Abdullah Öcalan, the leader of the PKK.[118] While one condition of these negotiations was that the militants would leave the country, open source information suggests that a full-scale demilitarization of the PKK has yet to take place due to disagreements on how the peace process would proceed. While it is unclear exactly how many PKK militants reside in Turkey, news reports cite

various figures, ranging from 1,500[119] to 3,000[120]and some even reporting 5,000.[121] Similar sources also suggest that the PYD has close to 7,000 militants[122] that could support PKK operations and that the PKK has additional 2,300-2,500 militants in Northern Iraq.[123] Therefore, the PKK has a large pool of manpower that can pose a threat to Turkey's future nuclear infrastructure, especially to Akkuyu because of its proximity to the PKK's traditional area of operation and logistical base.

Furthermore, according to Turkish news reports, the PKK has a significant arsenal at its disposal. The weapons that the organization possesses include: rockets (approximately 2,000); AK-47s (close to 20,000); Dragunov sniper rifles; Mauser rifles; PK machine guns; G-1s; M-16s; other machine guns, rifles, and sniper rifles (close to 10,000); more than 4000 pistols; 5,000 hand grenades; 15,000 land mines[124];and a number of anti-tank and anti-air weapons, among other assets.

The organization has been dormant but has not given up its weapons, and the peace process is far from complete. The PKK issued ceasefires in the past but used them as opportunities to rearm and reorganize its forces. According to a recent report compiled by police and gendarmerie intelligence, the PKK gained 2,000 new members during the peace process, but most did not receive military training and only 1,000 militants in total are left at Turkish borders.[125] According to the same report, while the organization moved out a portion of its small arms arsenal across the border, heavy arms remained within. The organization also stockpiled medicine and rations near the border.[126]What's more, the Kurdish nationalist political party, the Peace and Democracy Party (BDP), won 11 of 82 municipalities in Turkey in the last municipal elections, most of which were concentrated in eastern and southeastern cities.

The BDP has sent mixed messages regarding a potential declaration of autonomy in the region.[127-128] For example, in April 2012, a member of the party argued that the local government should be given a share of the revenue from oil drilled in Diyarbakır and argued in favor of more measures to strengthen local governments.[129] If the peace process collapses and the BDP unilaterally declares autonomy, there is a possibility that Ankara will intervene militarily, as it has in the past, which would result in the resumption of violence and PKK activity.

Likelihood of Targeting Critical National Infrastructure: History, Motives, and Prospects

In the past, the PKK employed various tactics to delay the construction, cripple the facility, and hamper the response capabilities of security forces when targeting critical national infrastructure, including oil[130-131] and gas[132] pipelines and dams.[133] In two separate cases in the last few years, militants dug up the area around the pipelines to plant remotely detonated explosives.[134] In other instances the organization killed construction workers, planted explosives, and attacked the command and control center of a hydroelectric power plant regulator[135] using hand grenades, small arms, killed construction workers using long barrel rifles,[136] planted mines, remotely detonated explosives on the paths that the security forces would follow to intercept the attacks.[137] In August 2013 alone, TİKKO, the military wing of the Party/Marxist Leninist-Conference, conducted 24 separate attacks on hydroelectric power plant construction sites,[138] allegedly in conjunction with the PKK.

The PKK's past attacks on CNI suggest that the organization might also be interested in targeting Turkey's prospective nuclear infrastructure and its link to the electricity grid to inflict economic costs to the Turkish government. Furthermore, depending on its political calculations, the organization may

conduct a sophisticated attack to display its strength and the weaknesses of the Turkish security forces. In case the organization decides to resume violence, it may prefer high profile terror attacks to invoke fear among the populace and coerce the government, and attacks on nuclear facilities and the diversion nuclear and radioactive material may be appealing targets in that regard. Although the PKK relies on public support, this has not stopped the organization from conducting mass casualty attacks, including towards ethnic Kurds, in the past. The PKK is an experienced, organized force with a wide range of military assets. Although varying in strength, PKK militant cells have already been established in urban and rural centers around the two planned nuclear power plants. The organization has financial guarantees stemming from illicit economic activities. The PKK is cooperating with internal and external actors that can provide arms, intelligence, money, and manpower. Even though the organization has been dormant for the time being, it is possible for the organization to resume violence in the near future. It is also conceivable that rogue, hawkish segments of the PKK could take up arms and carry out an attack on the future nuclear infrastructure.

Threats

The PKK and its affiliates could threaten Turkey's planned nuclear facilities through multiple means, including but not limited to: kidnappings of scientists or facility personnel, raids on transport shuttles carrying facility personnel, attacks using suicide bombers, land vehicles rigged with explosives, long barrel rifles, grenades, rocket launchers, anti-tank weaponry, mines, IEDs, automatic and semi-automatic rifles, and ambushes on transport carrying sensitive radioactive material like fuel and waste. The PKK could attack the facilities during construction or sabotage the facilities when operational. It is unclear whether the organization would attempt to steal fissile material by intercepting nuclear waste transports or trespassing into the facility for the purpose of making dirty bombs or procuring goods to sell on the black market. Currently, the PKK does not have much of a presence in cyberspace, so it is unclear, though unlikely, that the organization has the ability to hack complex facility networks, intrusion detection systems, or alarm systems. Although these may be true for most terror organizations, the PKK's three decades long experience and the resilience that it has displayed so far makes it a more capable terror organization than others currently operating in Turkey.

Despite the PKK's large recruiting base, the likelihood of the organization successfully planting insiders in the facilities is doubtful. The Turkish National Intelligence (MIT) will conduct a major screening and vetting process before any personnel are hired. News reports suggest that even interns and low-level contractors will be vetted.[139]Furthermore, military intelligence, police intelligence, and the MIT have been closely following the PKK's potential recruits and sympathizers for the last three decades. Therefore, although possible, it is unlikely that the PKK would be able to plant insiders or turn high- and mid-level employees. The PKK's inability to secure people on the inside would obstruct access to critical information concerning the operation of the facilities, their design, and the fuel cycle, and would impinge on their ability to shut down detection, delay and alarm systems, or conduct sabotage from within the facilities.

Waterborne assaults and airplane hijackings have not been the PKK's modus operandi (MO) thus far. However, the lack of precedent does not mean that the threat is absent, but it means that the PKK may be less likely to utilize these means over the others mentioned earlier.

Radical Left-Wing Terror Organizations

DHKP/C

Brief history

The Revolutionary People's Liberation Party-Front (DHKP/C) has roots that date back to the rise of left-wing youth organizations in the 1960s. The People's Liberation Front of Turkey (THKP-C), founded in 1970 and led by Mahir Çayan, sought to trigger a Marxist-Leninist revolution in Turkey through armed struggle akin to Latin American guerilla groups. The group, however, splintered off into numerous organizations after most of its leadership was killed in 1972. In 1978, one of the offshoots called the Revolutionary Left (Dev-Sol) was formed under the leadership of Dursun Karataş. Dev-Sol targeted former and incumbent high-ranking Turkish officials, the military, and police. Following internal power struggles in the beginning of the 1990s, Karataş lost control of the organization only to regain it again in 1994 and form the Revolutionary People's Liberation Party/Front.[140] *Party* refers to the political activities of the organization, whereas *front* refers to its militant wing. The organization has henceforth continued its operations in urban and rural areas as well as in prisons. Following the death of Karataş in 2008, the organization became relatively silent until 2012, when it gradually started making a presence in street protests and attempting high profile attacks.

Mode and Pattern of Conflict

In order to bring about a Marxist-Leninist revolution, the organization declaredly aims to initiate armed clashes in both urban and rural areas of the country at the same time and eventually turn these isolated clashes into a major low-intensity conflict.[141] Except for the assassination of members of the business elite in 1996, the organization has mainly targeted the police, armed forces, government buildings, and U.S. and NATO targets in Turkey, using explosives, firearms, suicide bombers, and RPGs[142] in general.[143]Particularly since 2013, the organization has reportedly maintained a visible presence in street protests in urban centers.[144-145]

Domestic and International Collaborators

According to a joint statement published in Serxwebun, a PKK-affiliated journal, the PKK and DHKP called for the establishment of a united front to combat the Turkish state in 1996.[146]Since then, both sides have conducted joint operations in the Black Sea region,[147] and, according to testimony by Abdullah Öcalan, the PKK has provided training to DHKP/C.[148]

Allegedly, the organization raises most of its funds through donations and extortion from residents of European countries[149] and is present in Greece, Germany, Belgium, Netherlands, Spain, and Italy.[150] The organization is believed to have had training camps in Syria during the 1990s,[151] which were allegedly reestablished following the eruption of the Syrian civil war[152] and the downturn of relations between Ankara and Damascus.

Current Operational Strength and State

According to the U.S. Department of State Country Report on Terrorism 2013, the DHKP/C probably has "several dozen"[153]members in Turkey and a support network throughout Europe, while the University of Maryland National Consortium for the Study of Terrorism and Responses to Terrorism puts this number at "less than 1,000 members."[154] The organization mostly targets prisons, university campuses, and marginalized neighborhoods in urban centers for recruitment; hence, while the actual number of militants may be relatively low, the number of sympathizers – a potential pool for future recruits – may number several thousand[155-156].

After years of minimal activity, the DHKP/C made a comeback in 2012 and has executed several high-profile attacks ever since, including a suicide bombing at the U.S. Embassy in Ankara. Yet Ankara has had some success against the organization through successful operations of the Turkish National Police. Furthermore the designation of DHKP/C as a terrorist organization by the United States, United Kingdom, and the European Union has been a positive development for Ankara.

Likelihood of Targeting Critical National Infrastructure: History, Motives and Prospective Threats

Attacking CNI has not been the MO of the DHKP/C and its predecessors. Still, the organization has been trying to elevate its profile since 2012 and NPPs present high-value targets. Past DHKP/C operations of DHKP/C do not suggest that the organization has enough sophisticated knowledge, weaponry, and planning to pose a significant threat to NPPs, but they may assist other organizations in doing so. The DHKP/C's alleged links to Syria could also mean that it could potentially serve as a proxy to Damascus or Turkey's other regional rivals.

The DHKP/C is one of many offshoots of a left-wing militant tradition that goes back to 1960s. Therefore, even if the organization does not survive until the NPPs go online – either due to successful operations by Turkish security forces or internal power struggles, or both – it is likely that other organizations following the same ideological tradition will take its place. Therefore, at the time of writing, the threat that the DHKP/C poses to Turkey's prospective nuclear program appears to be low, but this assessment can change over the years leading up to the NPPs' completion depending on the organization's evolution and regional trends.

Other Left-Wing Militant and Terrorist Organizations

There has been a marked rise in support for left-wing ideologies in Turkey, especially after the 1960s, which has translated into a proliferation of both legal and illegal radical left organizations. Even today, most of these organizations break off into smaller groups or unite with other factions along ideological lines or internal power struggles, resulting in a multiplicity of acronyms that are beyond the scope of this paper. According to a 2007 report by the Turkish National Police, the present left-wing terror organizations (other than the ones provided above) are: the Marxist Leninist Communist Party (MLKP), the Turkish Communist Party/Marxist Leninist-Conference (TKP/ML-KONFERANS), the TKP/ML-KONFERANS's military wing TİKKO, and the Maoist Communist Party (MKP).[157]

After the coup of 1980, Turkish security forces dealt a heavy blow to most of these organizations and their predecessors. Some relocated to rural areas in the eastern Black Sea region[158] and eastern Turkish provinces, such as Tunceli,[159] whereas others chose to stay in major urban centers. Some cooperated with the PKK, for example by enabling access to the eastern Black Sea region in exchange for training, resources, or participation in joint operations. One example of joint operations is the bombing of the control building of a hydroelectric power plant in Tunceli in July 2013 by seven armed TİKKO militants. MKP militants previously attacked the same plant.[160] As recently as July 2014, the Turkish National Police apprehended a MLKP militant who allegedly received training in PKK camps.[161]

Albeit fragmented, these organizations may pose some threats to Turkey's prospective NPP. Although their names, alliances, and ideologies may shift in the future, as they frequently have in the past, they routinely forge alliances with major terror organizations, such as the PKK. Most of these terror groups come from traditions of armed struggle that go back decades and hence have significant experience in sabotage, handling explosives, and guerilla warfare. Moreover, radical left-wing organizations in Turkey primarily choose government targets and are known to attack CNI. In the July 2013 attack in Tunceli, TİKKO militants reportedly stated that they attacked the hydroelectric power plant because it harmed the environment.[162-163] The planned NPP in Sinop, though not in the immediate vicinity, will be close enough to the areas of PKK and related activity in the Black Sea region, and the Akkuyu NPP, which will be located in southern Turkey, will be close to the PKK's usual realm of activity.

Religious Fundamentalist Terror Organizations

TURKISH HIZBULLAH

Brief History

Turkish (also referred to as Kurdish in some sources) Hizbullah is a now dormant terrorist organization that is set on establishing a Sunni Islamist state in southeastern Turkey. It gradually came into fruition during meetings at a religious bookstore in Diyarbakır in the 1980s and has no relation to the terror group in Lebanon with the same name. Soon after its founding, Hizbullah split into two groups, one of which argued in favor of armed struggle and the other which argued that the appropriate time for radical actions had not yet come.[164] While infighting continued throughout the 1980s, both factions retained their ideological and logistical ties to the Islamic Republic of Iran.[165] The organization slowly spread to other major cities in southeastern Turkey and beyond, including Istanbul and Bursa. By the beginning of the 1990s, Hizbullah focused its attention on the Marxist-Leninist PKK. During the four-year period of1991-1995, more than 700 militants and sympathizers from both sides were killed,[166] most of them by Hizbullah. For this reason, it is alleged that Hizbullah had ties to Turkish security forces and Ankara.[167-168-169]

Hizbullah gradually began to target people who displayed "un-Islamic behavior" – for example, people who drank or did not follow the dress code[170] – as well as journalists and businessmen.[171]The Turkish National Police started conducting major operations against Hizbullah during the second half of the 1990s and managed to kill its founder in January 2000. Although targeting the state had not been the MO of the organization for a long time, it killed the Diyarbakır police chief and five of his bodyguards in retaliation a year after the Turkish National Police operation.[172] The group has not conducted any major operations since 2002 but instead continues to play a role through NGOs and Islamic education courses. It recently formed a political party under the name of HÜDA-PAR.

Mode and Pattern of Conflict

The organization used different methods of violence on more than 1,392 occasions to punish those who did not follow their beliefs. The resorted to close range assassinations, public sword and cleaver strikes, bombings, arson, kidnappings, extortion, and, most notoriously, vivisepulture – burying someone alive.[173]Hizbullah mainly targeted ideological rivals, such as the PKK, and civilians. Although the overthrow of the secular government in Ankara was among Hizbullah's goals, operations against government forces, infrastructure, and security forces were not the MO of the organization except in a few cases.

Domestic and International Collaborators

Hizbullah recruited members in mosques, book stores, religious courses, and its NGOs. The organization's Kurdish identity also helped it garner support among religious ethnic Kurds in Turkey. Although it had a different sectarian outlook, the organization was influenced by the Islamic revolution of 1979 and may have had logistical and ideological ties with Iran. Furthermore, Uslu argues that Hizbullah

had strong ideological similarities with Al Qaeda and Ansar al Islam,[174]based on evidence that the organization openly supported al-Qaeda on its web page and had "ask[ed] its members to join the jihad in Iraq."[175]However, there is no open source information to suggest that Hizbullah is actively cooperating with these two organizations or with Iran.

Current Operational Strength and State

During the police raids in 2000 and 2001, more than 2,000 individuals were detained under suspicion of having ties to Hizbullah and several hundred of them were later arrested by court order.[176]A considerable amount of arms, including grenades, rocket launchers, explosives, mines, and long-barreled arms were seized during the raids which spanned at least 52 of 81 cities.[177]The organization has not conducted any terror operations since 2002 but has used this period to recruit new members,[178] expand its support base, and increase its outreach capabilities through "Islamic NGOs, charities, soup kitchens, Koran courses, bookshops and media outlets across Turkey."[179]

One indication of Hizbullah's growing support is the sheer size of the public rallies it has organized. In one mass meeting in Diyarbakır on April 18, 2010, it gathered an estimated 120,000 to 300,000 people to celebrate the anniversary of the Prophet Mohammed's birthday.[180] In 2011, 23 imprisoned Hizbullah members awaiting trial, including two top-level executives and the head of the military wing, were released on parole as a result of a change in the law.[181] Instead of following their parole conditions, they fled the country soon after their release.

Likelihood of Targeting Critical National Infrastructure: History, Motives, and Prospective Threats

Considering that the organization has little history of targeting national infrastructure and very few instances of targeting government targets, it appears that Hizbullah does not pose an immediate threat to Turkey's prospective nuclear program. Although not a prime threat to Turkey's NPPs, the organization's growing number of sympathizers – which could serve as a source for potential recruits if the organization resurfaces – and its possible collaboration with other religious fundamentalists should be reasons for vigilance in years to come.

IBDA-C

The Great East Islamic Raiders-Front (IBDA-C) is a militant Sunni terror organization that was founded in 1970. The organization aims to overthrow the existing secular regime in Turkey and establish a federative state ruled according to Islamic law. IBDA-C has primarily chosen civilian targets, "including: churches, charities, minority-affiliated targets, television transmitters, newspapers, pro-secular journalists, Ataturk statues, taverns, banks, clubs, and tobacco shops"[182] and preferred arson, bomb attacks, Molotov cocktails, and sabotage in general. Most notoriously, IBDA-C has praised the Sivas massacre of 1993, an event in which fundamentalists set ablaze a hotel, leading to the deaths of 35 mostly Alevi intellectuals.[183]It also claimed joint responsibility with al-Qaeda for the 2003 Istanbul terror attacks. Although Turkish authorities insisted that IBDA-C did not have the organizational capacity to conduct the 2003 bombings,[184] there is evidence that suggests IBDA-C might have ties to al-Qaeda.[185-186]

Rather than a strictly top-down structure, IBDA-C is made up of loosely aligned cells (fronts), similar to al-Qaeda. On the condition that they internalize IBDA-C's philosophy, the cells conduct their operations based on their own preferences for method, time, and place.[187] The organization has not conducted any major operations for the latter part of the decade. Targeting government entities and CNI has not been its MO thus far. However, its suspected ties to al-Qaeda and other radical Islamist terror organizations means that IBDA-C could cooperate with these organizations in damaging terror attacks in order to raise its own profile. Under current conditions, it does not appear that the organization poses a major threat to Turkey's prospective NPP, but its ties to Islamist terror organizations should be closely monitored.

AL-QAEDA IN TURKEY AND THE AL-NUSRA FRONT

Al-Qaeda in Turkey made headlines by attacking two synagogues in Istanbul on November 15, 2003, and then attacking the British Consulate and the HSBC Bank Central Directorate in Istanbul five days later, killing 61 (including the four suicide bombers) and injuring 647 people.[188] The organization attempted another high-profile attack one year later, plotting to bomb the June 2004 NATO Istanbul Summit, which was successfully thwarted by the authorities. In 2004, al-Qaeda operatives succeeded in attacking a Masonic lodge in Istanbul, killing one. A few years later in 2008, they attacked the U.S. Consulate in Istanbul, claiming the lives of three police officers.[189]Despite these acts of terrorism, overall, the Turkish police and security forces have proven to be effective in foiling al-Qaeda plots and monitoring its activities.[190]

In Turkey, al-Qaeda has mainly targeted Jewish and Christian religious sites and Western institutions like consulates. Al-Qaeda considers Turkey to be an "apostate" state because Turkey was the state to abolish the caliphate. The terror group also finds fault with Turkey, one of the few secular Muslim nations, for being a member of NATO. In one raid against al-Qaeda militants in Ankara in 2011, it was discovered that the militants plotted an attack on the Turkish Parliament.[191] Reportedly in the same raid, the Turkish police also found documents suggesting it would be best to start global jihad from Turkey instead of waging war against the U.S. and other Western powers.[192]

Furthermore Turkey purportedly has several thousand domestic Salafi Muslims who may serve as a recruitment pool for al-Qaeda. The presence of the al-Nusra Front and other al-Qaeda-affiliated organizations in Syria presents an additional challenge for Turkey against this backdrop. The al-Qaeda affiliates within and around Turkey could join efforts to carry out high-profile attacks in Turkey. Multiple assessments put the al-Nusra Front's total manpower to around 5,000 men.[193]The al-Nusra Front attracts a sizeable number of foreign fighters. The organization frequently employs suicide bombs and possesses considerable military materiel, including anti-aircraft weaponry.[194]

Al-Qaeda has shown an interest in obtaining WMD capabilities, though it is unclear whether the organization has managed to obtain the required materials and expertise to make that goal a reality.[195]As al-Qaeda publications underline, NPPs make some of the best targets for spreading fear among the populace.[196] Furthermore, as previously outlined, organizations interested in building RDD may target nuclear facilities or intercept transfers of radiological and nuclear material to obtain the necessary material for building these devices for themselves. Reports claim that al-Qaeda

and the Taliban have targeted nuclear sites in Pakistan before[197-198] and may have kidnapped officials and technicians working at nuclear sites.[199]

Furthermore, in 2013, twelve suspects were apprehended in Adana, Turkey, on the grounds of suspected ties with al-Qaeda and al-Nusra. The case became controversial, as it was initially reported that the suspects were in possession of 2 kg of sarin but subsequent reports argued that the suspected material was in fact precursor chemicals, not sarin.[200] All suspects were eventually released and the case has been adjourned.[201]

Although it is uncertain how al-Qaeda affiliates in the region will change in the next decade or whether they will ever pose a direct threat to Turkey's prospective nuclear facilities, the looming possibility is unlikely to go away and should be monitored closely.

Foreign-Based Terror Organizations

ISLAMIC STATE OF IRAQ AND THE LEVANT (ISIL)

Brief History

The Islamic State of Iraq and Levant (hereafter ISIL) entered the spotlight with its shocking takeover of large parts of Iraq, including Mosul, the nation's second largest city. The roots of the extremist Sunni Islamic terrorist group's ideological and operational core originate in al-Qaeda in Iraq (AQI). Following the death of Abu Musab al-Zarqawi, leader of the AQI, in 2006, the organization underwent different mergers and names.[202] As recently as the early summer of 2014, ISIL's leader, Abu Bakr al-Baghdadi, appeared in a video and changed the group's name to simply the Islamic State.

In fact, the resurgence of al-Qaeda in Iraq paved the way for the rise of ISIL. In July 2013, the "Breaking the Walls" campaign conducted by AQI led to the escape of some 500 prisoners, the "majority of whom were detained during the Iraq War for terrorist activities."[203] In addition, the sectarian policies of the Maliki administration in Iraq coupled with the civil war in Syria set the ground for Sunni Arabs' tacit and open support for the extremist group. The power vacuum on the Iraq-Syria border enabled ISIL to gain a transnational, geopolitical character and control over smuggling routes. Clearly, while ISIL's organizational and ideological roots can be explained within the AQI context, its swift growth is a result of the geopolitical shift and sectarian narrative on Turkey's doorstep. Furthermore, ISIL and al-Qaeda Central continue to have their differences, as the former is intent on carving up a transnational state for itself under the leadership of al-Baghdadi who declared himself caliph on June 2014.

Mode and Pattern of Conflict

Following the takeover of Mosul and adjacent territories, ISIL seized relatively advanced military equipment from the fleeing Iraqi Security Forces. Such a

gain augmented the terrorist organization's abilities to conduct *Hybrid Warfare* operations, which combines regular and irregular concepts.

From a military standpoint, ISIL employs a wide array of violent techniques, ranging from armed attacks, assassinations, suicide vests, suicide vehicle-borne improvised explosive devices, sniping, and taking over major provinces.[204] In this regard, the Syrian and Iraqi battlegrounds have proven the combat-efficiency of the extremist group. Moreover, as recently as June 2014, ISIL kidnapped Turkish officials and their families, including the Consul General himself, from Turkey's Consulate General in Mosul.[205]

Therefore, if the terrorist organization's uptrend goes unobstructed, ISIL and its paramilitary capabilities will continue to be a major threat to Turkey. The planned nuclear power plant in Akkuyu in Mersin is a matter of special concern for Ankara due to its geographical proximity to Syria.

Domestic and International Collaborators

The rise in ISIL activity, especially in Iraq, can be explained by sectarian conflict resulting from the Maliki administration's policy of sidelining Sunni Arabs. In fact, the series of ISIL takeovers of vast Iraqi territories were possible due to the support of Sunni tribes.[206] Therefore, oppressed Sunni communities under the Shiite authoritarianism of Iraq and the Alawite dictatorship of Syria, fueled by the ongoing sectarian tensions in the region, make the Middle East Sunni Arab landscape a potential support base for ISIL.

Although there is no open source evidence available at the time of writing, some argue that wealthy donors from Gulf states, especially Kuwait, Qatar, and Saudi Arabia, have been covertly supporting ISIL.[207] According to a 2013 Brookings report, private Kuwaiti donors were unrestrained in choosing to help up to 1,000 rebel brigades in Syria due to relatively weak financial rules and "unique freedom of association" in the Gulf state.[208] In tandem, a *New York Times* op-ed penned by Ben Hubbard in November 2013 indicated that most of the Kuwaiti donors "shun the Western-backed Supreme Military Council" of the Syrian opposition, which ushered in the support of more Islamist extremists in Syria.[209]

In light of the issues discussed hitherto, it can be argued that the ISIL network is based on foreign jihadists fighting in Iraq and Syria, disaffected Sunni tribes, and wealthy private donors mainly based in the Cooperation Council for the Arab States of the Gulf (GCC) countries. ISIL and its network could target Turkey's critical assets, such as the planned nuclear energy infrastructure, depending on changes in the regional strategic balance and conjuncture.

Current Operational Strength and State

Following the fall of Mosul, ISIL reached its financial peak as a result of looting banks and treasury in seized territories, enabling the terrorist group to control about $2 billion USD.[210] In terms of number of fighters and battle-hardened experience, ISIL has the upper hand against Iraq, as evidenced in armed conflicts with Iraqi Security Forces. For instance, in April 2014 in clashes around al Humayra, ISIL elements used titanium-coated, armor-piercing ammunition in Dragunov-model rifles to stop Iraqi Hummers and wire-guided, anti-tank missiles to destroy Iraqi T-62s.[211] Likewise, during recent clashes, it is reported that a number of Iraqi M1A1 Abrams tanks and several helicopters were damaged or destroyed by ISIL elements.[212]

In sum, the organization could be defined as highly potent in terms of its current operational strength. ISIL is formidable and very capable in terms of diversity and effectiveness in terrorist activity. Estimates vary on the exact size of ISIL but the latest figures suggest it may be somewhere in between 30.000[213] and 50.000[214] fighters. The disenfranchised local Sunni groups with which ISIL has formed *de facto* alliances may also be used to draw further manpower in the years to come. Moreover, ISIL has a substantial number of foreign jihadists – which *The Economist* suggests may be around 3,000 fighters – some of whom are considerably experienced and battle-hardened from past jihadist campaigns across the globe. Furthermore, ISIL has been able to attract former generals of the Saddam-era Iraqi army, contributing significantly to its military planning and operational capabilities.

Likelihood of Targeting Critical National Infrastructure: History, Motives, and Prospects

As noted earlier, utilizing a wide array of operational courses of action is a key advantage of the terrorist group ISIL. Moreover, a highly disciplined command structure plays a crucial role in the rapid spread of the group's activity. ISIL's transnational geopolitical character and appeal to foreign jihadists augments the terrorist organization's capabilities to target Turkey's critical energy infrastructure. To put it briefly, depending on the scope of international pressure and measures taken against ISIL, the organization could pose a considerable threat to Turkey's planned nuclear power plants.

Yet, evaluating the prospects of an attack on the critical nuclear energy infrastructure would not solely depend on ISIL's abilities but also its intentions and strategic calculations. ISIL already threatened Ankara by kidnapping Turkish diplomatic personnel in Iraq. Attacking Turkey's domestic strategic assets would further fuel tensions and may compel Turkey to take firm military action against ISIL. However, the main threat that ISIL poses does not have to do with its strength but with its influence. The elongated presence and success of a jihadist organization near Turkey's borders can influence the religious groups in Turkey and cause currently dormant groups to wake up. At least several hundred[215] – potentially several thousand[216]– Turkish citizens are believed to have joined jihadist organizations in Iraq and Syria and they will present a security challenge to the Turkish government upon their eventual return to Turkey.

In these cases, the threat stems from the fact that these jihadists are no longer simply sympathizers of radical ideologies but are trained, battle-hardened warriors who have gone through ideological indoctrination. Though there are few instances in which Western jihadists plotted attacks in their home countries upon their return,[217] Turkey may be more susceptible to such threats for a number of reasons. First, it is situated in the immediate vicinity of the conflict zone and shares a long land border with Iraq and Syria, making it harder to detect returning jihadists. Second, Turkey has a noteworthy domestic support base, as exemplified by the domestic fundamentalist organizations in Turkey and multiple instances in which ISIL affiliates openly conducted recruitment events in Istanbul and other cities.[218] Turkey is already referred to as an "apostate state" by ISIL militants.[219]In the event that Turkey or NATO respond to the growing ISIL threat militarily, trained Turkish jihadists in Turkey would have ample opportunities to retaliate.

CONCLUSION

In order to meet its rising energy demand and diversify energy sources, Ankara is intent on pursuing a peaceful nuclear energy program, which is planned to come online gradually in the next decade. Turkey, however, is a country in a dangerous neighborhood and continues to face internal and external threats emanating from both state and non-state actors. The nation's prospective NPP may be attractive targets for its rivals in the region, their proxy terror organizations, or other terrorist and militant groups aiming to harm Turkey or access the sensitive materials and information that the NPP contains. Yet, as a late-comer to the nuclear scene, Turkey has the chance to tailor the safety and security measures of its planned NPPs from scratch. It can combine the expertise of other nuclear powers, NPP operators, and international organizations together with its experience combating state and non-state threats since the foundation of the country. This paper sought to highlight several areas governmental and non-governmental organizations should consider when undertaking this operation.

There are a myriad of ways in which adversaries could threaten Turkey's prospective nuclear program. These are not limited to the physical integrity of the NPPs. A hostile actor, state or non-state, may not be bold enough to attack an NPP directly but may prefer alternative ways, such as targeting nuclear fuel and radioactive waste (especially when in transit), sensitive information, and personnel. In some aspects, these can be far more vulnerable and more easily accessible than the reactor core. Therefore, the definition of *threat* extends beyond the facility site.

As outlined in the insider threat section, securing a nuclear facility is a constant operation. Turkish authorities should therefore ensure that the security of NPP operations are effectively regulated, overseen, and inspected. Furthermore, both the definition of the threat and the envisioned security measures should be constantly reviewed and updated according to the domestic and international threat landscape. These security revisions should be done with the collaboration of relevant government agencies, first and foremost among them the Turkish Atomic Energy Authority; Ministry of Energy and Natural Resources; Ministry of National Defence; Ministry of Transport, Maritime Affairs and Communication; Ministry of Interior; Ministry of Foreign Affairs; Prime Minister's Office; Ministry of Justice; Ministry of Customs and Trade; National Intelligence Organization; and the Ministry of Science, Industry and Technologies. The Akkuyu and Sinop NPP sites mostly fall under the purview of the Gendarmerie General Command, which is a part of the Turkish General Staff but commanded by the Ministry of Interior. It should be executed with the combined effort of the Turkish National Police, Turkish General Staff and Gendarmerie General Command, and the National Intelligence Organization.

Like securing a nuclear facility, defending a nuclear facility is also a constant operation. Both on-site and off-site security personnel should be trained to respond to a multiplicity of scenarios and tailor the defensive measures in the facility according to the threat landscape. Force-on-force exercises, in which attack scenarios are simulated by the inclusion of mock adversaries, prove to be valuable training methods for actual adversarial attacks. Furthermore these training and defensive measures should be reviewed periodically, not for the sake of fulfilling a bureaucratic requirement but for the sake of ensuring that the facilities are firmly guarded.

While the rewards of successfully attacking an NPP may be high for adversaries, so are the risks both due to the multiplicity of security measures and the likelihood of a painful retaliation. It is therefore important to assume that potential adversaries understand the magnitude of the risks they are taking (i.e. understand the conditions of deterrence) and will prepare to overcome these risks accordingly. In other words, not all hunters will decide to go after the stag instead of the hare, but the ones that do will be sure to pack a gun.

Turkey is plagued with domestic and international terror organizations. These organizations have cooperated with each other on numerous occasions and may do so again in the future – especially when targeting a high profile target such as a nuclear power plant. The Akkuyu NPP will be particularly vulnerable to terror attacks due to its geographical proximity to the area of operation of most terror organizations listed above. Furthermore, terror organizations in Turkey have been used as proxies by state actors in the past and may be used again in the future to target the country's NPPs. The rising profile of jihadist terror organizations – most notably ISIL – is especially worrisome for Ankara. In addition to the direct threat they pose to NPPs, they could also influence domestic terror organizations in Turkey that are empathetic to their cause. There are considerable numbers of Turkish citizens fighting alongside jihadists in Iraq and Syria, and their eventual return home will present further risks to the Turkish authorities.

As noted earlier, Turkey's critical energy infrastructure is not likely to face a state-led, conventional military threat. Nevertheless, ballistic missile proliferation could pose a threat, depending on the number, range, accuracy, and mobility. Moreover, WMD warheads could bring the risk of contamination, which would alter the threat calculus drastically. The overall geopolitical picture is critical as it might deeply influence Ankara's potential and actual competitors in their conduct against Turkey's critical energy infrastructure.

Both due to the potentially catastrophic results of a successful attack may have and due to their nature as critical parts of national infrastructure, ensuring the safety and security of NPPs, the buck cannot be passed solely to the project companies. As mentioned in Akkuyu NPP EIA, the Turkish state and its agencies are responsible for setting up a security regime for NPPs, tasking an agency or organization to prepare an emergency response plan which includes ways in which sabotage, theft, intrusion, terrorist attacks, threats or other malicious attempts are to be responded to, responding to potential emergencies from such adversarial actions, and drawing procedures for training security personnel[220]. While it is the responsibility of the project company to ensure the safety and security of the NPP site, prepare and implement on-site emergency response plans, disseminate information on these tasks to relevant governmental agencies and coordinate their efforts with the government's security forces, setting criteria, regulating and inspecting these defensive measures are also the responsibilities of the government. The EIA furthermore states that "preparing and executing defense plans for non-nuclear accidents or criminal actions (theft, sabotage, terrorist attacks or threats of terrorist attacks etc.) are to be done by respective governmental agencies and organizations".[221] Moreover, both emergency response and defense functions must and shall be coordinated with respective governmental agencies, requiring the government to be active in dividing tasks and authorities to its respective agencies to ensure the orderly cooperation and coordinating between the project companies and its agencies.

For these reasons, the Turkish leadership must draw up separate design basis threats for its prospective NPPs in a way that ensures that all of the aforementioned elements are incorporated and site specific risks and conditions are taken into account. It should also ensure that on-site and off-site security forces are properly trained and force-on-force exercises for multiple attack scenarios are regularly conducted. The aforementioned threats are not imminent, as the construction of the facilities has not commenced, and therefore there is no need for urgent action in these regards. However, there is dire need for preparatory action since NPPs present a set of unique challenges and any successful attack may have disastrous consequences. Ankara should make proper use of the ample time in its hands to tailor its precautionary measures and augment its capabilities based on a realistic understanding of the threat landscape that the country is faced with.

1_ This paper is published as part of a research project funded by the Nuclear Threat Initiative on the security of Turkey's nuclear program.

2_ The World Bank (2013) "Energy imports, net (% of energy use)" Accessed on 20 August 2014 from: http://data.worldbank.org/indicator/EG.IMP.CONS.ZS

3_ Kumbaroglu, G. (2014) "Turkey and Nuclear Energy"

4_ There continues to be considerable uncertainties regarding the country's nuclear program, including over vital matters such as the country's nuclear fuel and waste options and plans. For a comprehensive discussion on the issue, please see Bilezikci Pekar, C. (2014, May) "Turkey's Nuclear Power Plants and Nuclear Fuel Cycle Options" EDAM Discussion Paper Series 2014/4 accessible on: http://edam.org.tr/Media/Files/1157/Fuel_Cycle_Pekar.pdf

5_ T.C. Ulaştırma Denizcilik ve Haberleşme Bakanlığı, Bilgi Güvenliği Derneği (2012, June) "Ulusal Siber Güvenlik Stratejisi: 2023'ün siber uzayında güçlü ve önder bir Türkiye için" pp.11-12

6_ The sensitivity and criticality of the threat that nuclear materials pose on human health depend both on the quality and the quantity of the material in question. The IAEA for example, outlines different safety and security measures for uranium and plutonium under three different categories based on the enrichment level, isotope number and quantity of the material in its "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities" INFCIRC/225/Rev.4, (June 1999). The same classification was also included in the annex of Turkey's nuclear energy cooperation deal with Japan.

7_ A separate EDAM research project focusing specifically on cyber security in Turkey and in the context of nuclear power plants is currently underway, and is expected to be published by the end of 2014.

8_ United States Nuclear Regulatory Commission "NRC Regulations (10 CFR) Part 73 – Physical Protection of Plants and Materials"

9_ United States Nuclear Regulatory Commission (2013, April) "Nuclear Power Plant Security Assessment Guide" NUREG/CR-7145

10_ Holt, M.; Andrews, A. (2014, January 3) "Nuclear Power Plant Security and Vulnerabilities" Congressional Research Service RL34331 pg.1

11_ Ibid.

12_ United States Nuclear Regulatory Commission "NRC Regulations (10 CFR) Part 73 – Physical Protection of Plants and Materials" 10 CFR 73.1

13_ Emphases added by the author

14_ United States of America Nuclear Regulatory Commission, (2002, February 25) "Order Modifying Licences" accessible from: http://www.nrc.gov/reading-rm/doc-collections/enforcement/security/2002/security-order-2-25-02.pdf

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18_ Laaksonen, J. (2013, November 4) "International Standards of Safety and the Modern Projects of Nuclear Power Stations" Presentation delivered at the 2nd ASEM Seminar on Nuclear Safety, Vilnius, 4 November 2013.

19_ United States Nuclear Regulatory Commission (2013, April) "Nuclear Power Plant Security Assessment Guide" NUREG/CR-7145 pg.46

20_ United States Nuclear Regulatory Commission (2013, April) "Nuclear Power Plant Security Assessment Guide" NUREG/CR-7145

21_ The 3740 page long report provides lenghty and detailed information on the safety and safeguard precautions. While the technical aspect of the issue is beyond this paper, more information can be gathered from: 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı Ve Yaşam Merkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf

22_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı VeYaşam Merkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf, Section V.2.1-2.5 pp. 33-34, 83-91

23_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı VeYaşam Merkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf, Section V.2.1-2.5 pp. 76

24_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf Section III p. 11

25_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf , Section XI p.36

26_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, Section IV.3.1.-3.10 Annex IV.3.1-3.10-22 p. 138 http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf

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29_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı Ve Yaşam Merkezi) ÇED Raporu, Section X p.14 http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf

30_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı V eYaşam Merkezi) ÇED Raporu, Section V.1.1.-1.28 p.68 http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf

31_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı V eYaşam Merkezi) ÇED Raporu, Section VIII p.2 http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf

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39_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf, Section V.1.1-1.28 p.21

40_ Ibid. Section V.1.1-1.28 pp.21,74

41_ Ibid. Section V.2.15-2.29 p.9

42_ Ibid. Section V.1.1-1.28 p.93

43_ An alternative to these may be the the Port of Mersin, which is the biggest port in Turkey in terms of total area, maximum depth, ship and cargo capacity and number of workers . Due its size and other technical features, the port may be preferable for shipping nuclear material, but the same reasons and its relatively far distance compared to the two other ports may create additional security challenges for the transportation of radioactive material and may hence make the port an undesirable location for their shipment.

44_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı VeYaşam Merkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf, Section V.1.1-1.28 p. 74

45_ If the sides decide to forego the sea route and prefer air, they would most likely use one of the following airports. Gazipaşa Airport (170 km ~ 100 miles), the planned Çukurova Airport (180 km ~ 110 miles), Adana Airport (221 km ~ 135 miles) or Konya Airport (290 km ~ 180 miles). The U.S. Air Base in İncirlik (230 km ~ 140 miles) is the only other airport in the 300 km (~ 185 mile) radius of the area. None of these airports have railroad connections to the planned site, and would need to use the D400 highway (transports from the Konya airport to the north would likely use the D715 highway as well) to reach the Akkuyu site.

46_ Republic of Turkey General Directorate of Highways "AkdenizSahilYolu 2015'te TrafiğeAçılıyor", Accessed on 16 April 2014 from: http://www.kgm.gov.tr/SiteCollectionImages/KGMimages/Root/BasindaKGM/Ocak2014/AKSAM_20140111_16.jpg

47_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf , Section V.2.1-2.5, p.103

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50_ Akkuyu NGS AŞ Webpage (2013, October 2) "The territory of <<Akkuyu>> NPP got the status of the special security zone". Retrieved on 20 April 2014 from: http://www.akkunpp.com/the-territory-of-akkuyu-npp-got-the-status-of-the-special-security-zone/update

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57_ Bunn, M.; Sagan, S. D. "A Worst Practices Guide to Insider Threats: Lessons from Past Mistakes" (Cambridge, Mass.: American Academy of Arts and Sciences, 2014)

In this publication Bunn and Sagan compile a list of ten lessons learned from past incidents involving insiders. While it is beyond the scope of this article to delve deeper in the subject, the headlines from the list is as follows: "Do not assume that serious insider problems are 'not in my organization'", "do not assume that background checks will solve the insider problem", "do not assume that red flags will be read properly", "do not assume that insider conspiracies are impossible", "do not rely on single protection measures", "do not assume that organizational culture and employee disgruntlement do not matter", "do not forget that insiders may know about security measures and how to work around them", "do not assume that security rules are followed", "do not assume that only consciously malicious insider actions matter", "do not focus only on prevention and miss opportunities for mitigation".

58_ United States Nuclear Regulatory Commission "NRC Regulations (10 CFR) Part 73.32 – Physical Protection of Plants and Materials"

59_ 4.800 MWeKuruluGücünde Olan Akkuyu NükleerGüçSantralıProjesi (NükleerGüçSantralı, RadyoaktifAtıkDepolamaTesisi, Rıhtım, DenizDolgu Alanı VeYaşamMerkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf , Section V.1.1-1.28, p.91

60_ Ibid. Table V.1.28-1

61_ 4.800 MWe Kurulu Gücünde Olan Akkuyu Nükleer Güç Santralı Projesi (Nükleer Güç Santralı, Radyoaktif Atık Depolama Tesisi, Rıhtım, Deniz Dolgu Alanı VeYaşam Merkezi) ÇED Raporu, http://www.csb.gov.tr/turkce/dosya/ced/Akkuyu_nihai.pdf Section V.2.15-2.29 p.13

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82_ http://aviationweek.com/defense/sampt-missile-defense-goes-three-three, Accessed on: August 23, 2014.

83_ http://missilethreat.com/cheaper-high-speed-targets/, Accessed on: August 23, 2014.

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85_ Ibid.

86_ For a visual illustration of the system see: https://www.youtube.com/watch?v=3LPdmxnBkIU, Accessed on: August 23, 2014.

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Assessing Turkey's Capacity to Effectively Secure Its Nuclear Infrastructure: The Case for Transparency and an Integrated Approach

Ahmet K. Han

Advisor to the Rector and Faculty Member,
Kadir Has University

Board Member, EDAM

Mitat Celikpala

Dean, Graduate School of Social Sciences,
Kadir Has University

Doruk Ergun

Research Fellow, EDAM

INTRODUCTION

Turkey is moving forward with its ambition to switch to nuclear energy, the latest of which is the approval of the Akkuyu nuclear power plant's (NPP) environmental impact assessment, which has paved the way for the construction of the facility. Still, nuclear energy comes with risks as well as opportunities, and the country lacks a solid framework for providing security to its prospective nuclear infrastructure and its affiliated operations.

Accidents, sabotage, terrorist attacks, and unexpected disruptions to operations all result in human, economic, commercial, and political costs, as well as a loss of prestige. These chains of events may result in the degrading of a country's credit score and may lower the appeal of the host country in the eyes of others, no matter how strategic its location and how rich its energy resources are. Therefore the security and safety of critical electricity infrastructure (CEI), and especially nuclear power plants, is as important as the security of energy supply and demand as it can impact both aspects directly. In order to secure its nuclear facilities adequately, Turkey needs to enact a multilayered and holistic framework for the protection of both CEI in general and NPPs specifically.

Treating Akkuyu as a case study, this work aims to assess possible threats to Turkey's nuclear infrastructure and analyze the currently established legal and regulatory framework, as well as response capabilities for the protection of this critical asset. To this end, the study will first analyze the internationally established frameworks for the physical security of the critical energy infrastructure (CEI), then appraise Turkey's policies on critical and nuclear infrastructure security before concluding with recommendations to enhance the existing framework.

Building Blocks of Physical Security of the Critical Energy Infrastructure

The physical security of CEI depends on various foreseeable, human-based, and unforeseeable factors, such as unpredictable and unpreventable force majeure events like natural disasters. The multiplicity of these factors and the unforeseeable nature of some, require complex and effective security systems to be set up. As fire, accidents, deliberate attacks and various technical and physical problems can be encountered at nuclear facilities, refineries, or pipelines proximate to residential areas both during their construction and operational phase, securing CEI starting from the project phase and throughout the operational phase uninterruptedly becomes a necessity. e.

When contemplating solutions to actual and potential threats, the security of CEI facilities and systems requires a multidimensional approach that includes legal, technical, and administrative considerations. International cooperation and collaboration among different agencies is a necessary dimension to make this possible. In order to secure critical infrastructure, it is necessary for authorities to embrace the issue, institute a legal background, and assign responsibility according to the various parts of the policy and then lead these efforts simultaneously. As the threat environment is not static and evolves over time, threats to CEI and potential vulnerabilities of respective facilities should be assessed continuously. Response mechanisms parallel to technological advances should subsequently be

followed and best practices should be adopted and applied. Moreover, both local and international awareness of cyber threats to electronic systems should be raised, as electronic systems have become vital for both operating and securing CEI. The human factor is also present in all aspects of operating and securing CEI, requiring an adequately trained and experienced work force. Both public and private sectors are stakeholders in CEI and as such, they require constant cooperation to ensure the smooth and secure operation of the said facilities.

International Organizations Dealing with CEI and the Framework for Cooperation

In addition to the numerous nuclear safety and non-proliferation regulations that it is a part of, Turkey is also party to international arrangements dealing with critical infrastructure security. Following its fifteenth meeting in Madrid in November 2007, the Ministerial Council of the Organization for Security and Co-operation in Europe (OSCE) released Decision No. 6/07, titled Protecting Critical Energy Infrastructure from Terrorist Attack." Echoing the UN Global Counter-Terrorism Strategy and the G8 Action Plan on Global Energy Security adopted in 2006, the OSCE called for its members to take all necessary measures at the national level, address the increasing threat of terrorist attacks on CEI, and urge OSCE member states to cooperate and coordinate their measures. Furthermore, it has tasked the Secretary General to seek opportunities for cooperation with relevant international organizations and facilitate the exchange of best practices without duplicating ongoing activities.[1]

In light of efforts like the Public-Private Expert Workshop on Protecting Non-Nuclear Critical Energy Infrastructure from Terrorist Attacks conducted in Vienna in 2010, the OSCE has facilitated the publication of a Good Practices Guide on Non-Nuclear Critical Energy Infrastructure Protection (NNCEIP) from Terrorist Attacks Focusing on Threats Emanating from Cyberspace.With the collaboration of public and private experts from member nations and experts from NATO and the European Union (EU), the guide was released in March 2013.[2]

NATO has also shown an interest in the issue as exemplified by the Parliamentary Assembly Committee on the Civil Dimension of Security's 2007 annual session report, "The Protection of Critical Infrastructures."[3] In the Bucharest Summit the following year, the Allies published "NATO's Role in Energy Security," which sparked the process of what became the Energy Security Section in the Emerging Security Challenges Division with the 2010 Strategic Concept. Following the Bucharest Summit, the development of a capacity to contribute to energy security, "including the protection of critical energy infrastructure and transit areas and lines, cooperation with partners, and consultations among Allies on the basis of strategic assessments and contingency planning" became objectives of the Alliance.[4] Moreover, in 2012, the NATO Energy Security Centre of Excellence was accredited in Lithuania.

These efforts are complemented by NATO's increasingly more ambitious programs to provide cyber security and foster cooperation in cyber defense amongst Allies. In the 2014 Wales Summit, the Alliance enacted a new Enhanced Cyber Defense Policy. Under the new policy, cyber-attacks on a member state are considered a core task of collective defense. Whether these attacks warrant invoking Article V (mutual defense) commitments of the Allies will be decided on a case-by-case basis. The new NATO strategy also underscores the commitment to increasing

cooperation with industries through the NATO Industry Cyber Partnership, developing NATO cyber range capabilities, and collaborating with international organizations like the EU.[5]

The IAEA and Nuclear Security

The primary international institution working on nuclear infrastructure security and standardization on the global scale is the International Atomic Energy Agency (IAEA). The concept of an integrated approach forms the core of the IAEA's framework. The IAEA defines nuclear security as "the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear or other radioactive substances or their associated facilities". Hence 'physical protection' has a bigger role to play in nuclear security than in nuclear safety.

IAEA literature suggest that nuclear security culture is the agency's underpinning theme. According to the IAEA, nuclear security culture is defined as "the assembly of characteristics, attitudes and behavior of individuals, organizations and institutions which serves as a means to support and enhance nuclear security… The foundation of nuclear security culture is a recognition that a credible threat exists and that nuclear security is important." The formation of such a culture "is ultimately dependent on individuals: policy makers, regulators, managers, individual employees and —to a certain extent — members of the public… The concept of a nuclear security culture — and its promotion and enhancement — is refined with a view to establishing international guidance and raising the level of awareness of all concerned, including the public and private sectors".[6]

Based on its understanding of nuclear security and safety culture the IAEA calls for a comprehensive nuclear security regime and aims to develop global standards for the establishment of such a regime. In the agency's view; "A nuclear security regime includes a range of elements and activities, including: legislation and regulation; intelligence gathering; assessment of the threat to radioactive material and associated locations and facilities; administrative systems; various technical hardware systems; response capabilities and mitigation activities."[7]

The establishment of such a comprehensive, global regime primarily falls under the responsibility of states; however, it also requires governments to collaborate with the nuclear industry. The complex structure of relations and the inevitability of international cooperation prompted the IAEA to categorize risks to nuclear safety and security into four groups: security risks, production- and operation-related risks, commercial and financial risks, and strategic risks. The Oak Ridge incident illustrates the necessity of an integrated approach to address physical security risks to NPPs.

Security Culture and the Human Factor: Y-12 Oak Ridge Example

In matters of nuclear security, responsibility mainly lies with the government and regulatory authorities, making regulations and their implementation the most important dimension of nuclear infrastructure security. The United States has possibly the most well-endowed regulatory structure in the world. The U.S. Nuclear Regulatory Commission alone employs around 3,900 people and

has a budget over $1 billion. Federal regulations, such as those released by the Department of Energy, and military regulations, such as those of the U.S. Navy, further augment the United States' capabilities in nuclear regulation.[8]

All of this, however, did not stop three protesters – all of them over the age of 50, including an 83-year-old nun[9] – from breaching the outer security parameter and gaining access to the area surrounding the Highly Enriched Uranium Materials Facility at Y-12 Oak Ridge National Security Complex in July 2012. The Y-12 complex had previously been regarded as one of the most secure facilities in the U.S.– it is important to note thatUSD150 million that year alone was spent for the facility's security.[10]

The U.S. Department of Energy inquiry into the incident revealed that the facility's security personnel and administration displayed "ineptitude in responding to alarms… overreliance on compensatory measures, misunderstanding of security protocols, [and] poor communications."[11] In fact, the protestors approached the facility guard's vehicle and "surrendered" themselves before the guard could notice them, after which the guard let them "roam about and retrieve various items from their backpacks"[12] and failed to take any measures to secure the area even after a supervisor arrived at the scene. Furthermore, security equipment maintenance and repair were not completed in a timely fashion, and the aggregate impact of their absence on the security of the nuclear facility was not given much regard. The problem was worsened by the possibility that costs of maintenance, repair, and risk management could have led to overreliance on compensatory measures and equipment not being repaired at all.[13] The auditing process failed to identify these shortcomings as "the site office quarterly reports were based on the results of the contractors' self-assessments."[14]

The Y-12 incident is a clear reminder that securing nuclear facilities is a constant operation. Both the security measures and the contingency plans should be inspected, tested and updated in a timely fashion. Furthermore the technical capability of the inspector and its independence are also vital matters, as the incident clearly shows that relying on the contractor's self-assessments and security measures alone would not suffice.

Several probes conducted throughout 2012-2014 on how the U.S.' nuclear arsenal was secured revealed major issues, including but not limited to, blast doors that were left open[15], a cheating scandal on certification exams[16], and drug use by personnel[17]. All this highlights that regardless of the formidability of security measures, the human factor is an essential part of securing nuclear facilities and NPPs are not immune to human error. Hiring competent personnel, training them adequately and reviewing their performance regularly and stringently are vital parts of securing NPPs.

Similarly the human factor is the most essential part of the overarching security culture that spans through the operators and personnel on the ground to the regulators and decision makers at the top. Although the actual practices may differ due to the nature of each individual's tasks and duties within the general framework of the operation, each individual should be educated about and encouraged to abide by common values and practices related to security. These values and practices include, but are not limited to, engagement in and taking responsibility for security issues, caution in sharing sensitive information with both insiders and outsiders, reporting behaviors and activities of concern in a timely manner, and compliance with protective measures.

CRITICAL ENERGY INFRASTRUCTURE IN TURKEY

The security of nuclear infrastructure is a relatively new agenda item for Turkey. Existing and projected oil and natural gas pipeline projects have brought the issue of critical electricity infrastructure (CEI) security to the forefront of national debate. Threats to CEI due to regional instability and possible attacks by terrorist organizations like the Kurdistan Workers' Party (PKK) have made primarily oil and natural gas pipeline security a cause of concern.

In August 5, 2008, PKK claimed to have attacked the Baku-Tbilisi-Ceyhan pipeline near Refahiye in Erzincan province causing an estimated loss of USD 5 million per day only in transport revenues. Yet more recent claims refer to a Russia led cyber attack as the culprit of this security breach.[18] Despite these pressing problems, Turkey has not yet adopted a fully integrated CEI safety and security framework, which many argue is one of the most fundamental flaws in the country's security system.

Turkey has tried to define critical national infrastructure (CNI) and move towards an overarching cyber security policy, spearheaded initially by the Scientific and Technological Research Council of Turkey (TUBITAK) and more recently by the Prime Ministry Disaster and Emergency Management Presidency (AFAD).[19] So far, these efforts have not led to a clear definition of CNI, let alone the creation of a comprehensive strategy to defend them. Turkey therefore continues to lag behind its European and transatlantic counterparts in this regard. Still, if utilized correctly, this could provide Turkey the opportunity to incorporate the experience and best-practices of other countries and combine them with the geographical, social, and environmental conditions unique to Turkey to draft substantive policies.

A policy recommendation by the Turkish Ministry of Transport, Maritime Affairs, and Communications defines *critical infrastructure* as:

> "structures that, damages to or the destruction of which would hamper the continuity of public services and public order and; the partial or complete loss of their functionality would have detrimental effects on public health, safety, security and on economic activity and on the effective and efficient functioning of the government"[20]

The first step toward enacting modern, comprehensive regulation dealing with critical infrastructure was taken in March 2009 by the e-Regulation Working Group under the auspices of the Prime Ministry. The working group prepared an "e-State and Information Society Law Proposal Draft" on August 7, 2009. Even though the terms *critical infrastructure* and *critical information infrastructure* are not directly referred to in the document, the draft law defines *critical information system* but fails to go beyond that. It was not until 2013 that a more comprehensive definition of critical national infrastructure was established by the Cyber Security Council in its "National Cyber Security Strategy and 2013-2014 Action Plan," which came into effect according to Cabinet Decision No. 2013/4890 dated March 25, 2013.Similar to the recommendation document, critical infrastructure is defined as:

> The infrastructures which host the information systems that can cause,
>
> - Loss of lives,
>
> - Large scale economic damages,
>
> - Security vulnerabilities and disturbance of public order at national level
>
> when the confidentiality, integrity or accessibility of the information they process is compromised.[21]

Considering that these regulations are quite new and the idea of treating threats to critical infrastructure is fresh it can be concluded that setting up a comprehensive and inclusive policy on critical infrastructure elements in Turkey is still in its infancy.

The Law no. 2565 "Forbidden Military Zones and Security Zones Regulation," which was ratified in 1981 and came into effect in 1983, can be seen as the first regulation indirectly dealing with the protection of critical infrastructure.[22] Article 21 of this law lists forbidden military zones and security zones in detail. The zones included are those "belonging to public or private corporations, significantly contributing to the country's defense or economy, and the disruption, even if partial, or temporary suspension of which would have adverse effects to national security or social life."[23] The terminology used in the regulation could provide a standard set of definitions for critical infrastructure and its security. This law gives the Turkish General Staff – and therefore the state – the authority to set up or relinquish these zones. The fact that the said law focused only on the military and security aspects of the issue and offered only a limited role to other actors in the process was its major handicap.

Multinational projects such as the Baku-Tbilisi-Ceyhan pipeline and Nabucco natural gas pipeline suggest that the security of Turkey's CEI is orchestrated by case specific international agreements designed for a particular project instead of standardized regulations, leading to varying criteria to be applied on distribution of authority and responsibilities.

The situation signifies the lack of coordinated efforts that would lead to the development of procedural and cultural uniformity. The nonexistence of a special body or a unit within the existing organizational structure dealing specifically with the issue creates ambiguity and undermines the safety and security of the growing portfolio of CEIs. The addition of nuclear power to Turkey's energy mix will surely serve to increase the challenges involved and will make the need for a comprehensive and coordinated effort inescapable. While the policy plan should focus on an integrated framework, a strategy for securing CEI should also take into account the characteristics of the nuclear infrastructure. The unique aspects of nuclear power dictate a comprehensive nuclear safety and security culture to be adopted across the institutions dealing with the issue. The IAEA underlines that nuclear security culture necessitates "a recognition that a credible threat exists and that nuclear security is important."[24] The agency also emphasizes the need for an "integrated approach" that simultaneously considers the physical and cyber dimensions of security.

With regards to nuclear security and safety Turkey has acquired a considerable amount of knowledge and experience since the establishment of TR-2 Research Reactor in Çekmece Nuclear Research and Training Center (ÇNAEM) in 1959. ÇNAEM is coded as a threat level category 2 facility in terms of its criticality according to the drafted National Radiation Emergency Action Plan.[25] But Turkey

has no experience with large scale nuclear power. For instance the Akkuyu Nuclear Power Plant (NPP) is designated as category 1 according to the same draft Plan.[26] Without taking steps to make up for this lack of experience, the country would have to rely on its expertise in on-site and off-site security of CEI based mainly on internationally owned pipeline networks, hydroelectric power plants and its existing refineries. Still this approach would fail to account for the unique challenges of securing NPPs. The best approach therefore for enhancing Turkey's capabilities is to use international best practices as the basis of formulating Turkey's own guidelines.

Existing Regulations on Physical Safety and Security of Nuclear Infrastructure: Akkuyu & Sinop

Under current arrangements, the on-site physical security of critical national infrastructure is to be maintained by private security companies as outlined in the Law on Private Security Services passed on October 7, 2004.[27] According to this law, individuals and companies may hire security companies or form security units if decided upon by the special security commission and approved by the governor. The special security commissions are commissions set up in each city under the leadership of the deputy governor. The members include: the city police chief, city gendarmerie commander, representatives from the chamber of commerce, and representatives from the chamber of industry. Forming security units within a company and hiring a security company are not mutually exclusive. The special security commission is authorized to determine the minimum amount and characteristics of personnel, weapons, equipment, and, if needed, other equipment-based security precautions.

In general on-site security of critical national infrastructure is provided in cooperation with the technology, intelligence, and special force elements of Turkish security forces.[28] The Turkish Armed Forces, Gendarmerie, and the Turkish National Police can provide off-site security and inspect on-site security measures, but unless special arrangements are in place, their mandate does not cover providing on-site security to privately owned facilities.

Currently, the companies building the Akkuyu and Sinop power plants will decide on their own security measures. They would most likely hire a company as on-site security provider. This decision would be approved and inspected by the Turkish Nuclear Regulator - TAEK, the project company itself, and Turkish security forces.[29] Under its current capabilities, it is likely that TAEK will rely on the assets and expertise of Turkish security forces for the inspections as well. There are ongoing attempts among policy circles to formulate procedures for conducting inspections and establishing clear divisions of responsibilities for stakeholders. Considering that agencies may have different priorities and may thus produce conflicting inspection reviews, in the absence of a "chain of command" between stakeholders, issues with which criteria the project company should abide by may be a source of contention. Since trying to resolve such issues in a case by case manner may result in delays due to bureaucratic scuffle, it would be preferable to create a hierarchical structure and clear areas of responsibility for the agencies involved.

Maintaining on-site security of the facility requires multi-party coordination and cooperation. Under current circumstances, private security companies are foreseen to provide physical on-site security, necessitating the cooperation between private Turkish and Russian firms under the blessing of their respective governments. It should be underlined that considering the gravity of the task, competence of the

firms in question should be the main criteria for their selection.

In the absence of any comprehensive and detailed regulations and guidelines on the security precautions of NPPs nuclear facilities are seen as no different from other critical national infrastructure, such as pipelines. This fails to take into account the inherent risks of nuclear and radiological materials and the dire effects the inability to protect them would have. Furthermore, in the absence of a governing authority responsible for setting security requirements and supervision, the security measures in Akkuyu and in Sinop will be subject to different, ad hoc standards.

In the official agreement signed between Turkey and Russia in regards to Akkuyu, the security of the facility is only mentioned in the context of international agreements.[30] The agreement begins by outlining conventions and treaties that both parties are signatories of, including but not limited to: the Non-Proliferation Treaty (1 July 1968),Convention on Early Notification of a Nuclear Accident (26 September 1986), Convention on Nuclear Safety (17 June 1994), Convention on the Physical Protection of Nuclear Material (26 October 1979), and the Convention on Early Notification of a Nuclear Accident and Convention on Information Exchange on Nuclear Facilities signed by Turkey and Russia on August 6, 2009. The Turkey-Russia Akkuyu agreement refers to the IAEA's Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (5 September 1997). It also reiterates that nuclear equipment, material, non-nuclear special equipment, related technology, and their byproducts will be subject to NPT safeguards agreements with the Soviet Union (21 February 1985) when in Russian territory and to the NPT safeguards agreement with Turkey (30 June 1981) when in Turkish territory.

The only two references to Turkish arrangements are Article 7.2 and Article 8.1. Article 7.2 suggests that the Turkish side should hold the right to bar access to specific individuals to the nuclear facility site on the grounds of national security. Article 8.1 suggests that the NPP will be licensed and inspected congruent to Turkish laws and regulations on nuclear security and protection. Furthermore, Article 6.4 notes that, when hiring new personnel for the supply chain, the project company will take into consideration the general and specific security requirements of the NPP.

Turkey's deal with Japan builds upon the same international agreements but mentions physical security more explicitly.[31] Article 5 of the agreement says that both sides may enact mutually satisfactory arrangements to enhance nuclear safety and engage in bilateral meetings to increase nuclear safety and emergency preparedness capabilities. Article 6.1 adds that both Parties shall "apply measures of physical protection according to their respective criteria" and provides minimum standards of protection in an annex of the agreement. Article 6.3 paves the way for consultation between the parties on the adequacy of physical protection methods, whereas Article 6.4 notes that the sides shall act in conformity with their obligations resulting from the International Convention for the Suppression of Acts of Nuclear Terrorism. The aforementioned annex provides a three-step categorization of physical protection levels based on the quantity and irradiation quality of nuclear materials, which is an exact copy of the categorization presented in the IAEA's Physical Protection of Nuclear Material and Nuclear Facilities.[32]

Security for nuclear fuel and waste transportation will also have to be provided by private companies, yet the details are currently ambiguous. The Safe Transportation of Radioactive Materials, a Ministry of Energy and Natural Resources regulation passed on July 8, 2005, is based on the IAEA's Regulations

for the Safe Transport of Radioactive Material TS-R-1 edition.[33] The document is concerned with the safety of radioactive material rather than their physical security. According to a press release by the Ministry of Transport, Maritime Affairs, and Communication, security inspections during the transport of nuclear fuel will be conducted by the Ministry and TAEK[34]. The Preliminary Safety Analysis Report (PSAR) will explain the security measures regarding the transportation and handling of nuclear fuel.[35]

The Turkish Straits as risk enhancers

On the issue of waste management, in its 2014 Progress Report, the EU has took note that, "The law on acceding to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management is still awaiting approval by parliament".[36]On the other hand, in its own Progress Report of 2013, the last one out so far, Turkey's Ministry of EU Affairs was listing various efforts and regulations that are "in the process" of confirmation and structuring, including a number on waste management and related issues.[37] Nevertheless, so far the said Joint Convention remains unratified by the Turkish Parliament according to its own website.[38]

Akkuyu NPP deal mentions waste management in a statement saying that the matter falls under the responsibility of the project company.[39] Greenpeace's assessment of the Environmental Impact Assessment Report states that the waste management issue is still treated in "secrecy"[40] and both the political opposition and some experts are adamantly critical of the prevailing vagueness[41] and see this as a sign of further complications including, but not limited to, transportation of the waste and fuel in and out of the NPP.[42]

The transportation and logistical management of nuclear fuel and waste to and from the Akkuyu NPP will be vital issues. Properly managing nuclear waste entails specialized planning based on routes, modalities of transportation, and storage of nuclear fuel and waste.

Nuclear fuel and waste are at their most vulnerable when they are in transit. In 1998, Greenpeace activists demonstrated how defenseless cargo vessels could be when traveling through narrow strips of sea by boarding a vessel that was carrying mixed oxide fuel (MOX) while transiting through the Panama Canal. The Greenpeace activists used the cover of night to get close to the ship. The ship-deck watch mistook the protestors for canal security personnel and was caught by surprise.[43] The activists had managed to board the vessel without any resistance.

It is estimated that Russia will use the sea route to transport fuel to and take waste from the Akkuyu NPP in Mersin. Thus, Russia will have to rely heavily on the Dardanelles and Bosporus Straits, which lies in the middle of the demographic and financial epicenter of Turkey.

Turkey is party to international non-proliferation arrangements and is a signatory of both the IAEA Convention on the Physical Protection of Nuclear Material and its Regulations for the Safe Transport of Radioactive Material. The IAEA continues to renew its regulations, make specific recommendations, and update safety requirements of both of these binding documents. The Turkish government has drawn a number of regulations based on these documents, such as the Regulation on the Safe Transportation of Radioactive Matter released by the Ministry of Energy.[44] Turkey is also a party to the International Maritime Dangerous Goods

Code of the International Maritime Organization (IMO), which became effective and binding on January 1, 2004, through amendments made to the International Convention for Safety of Life at Sea Chapter VII. Another binding agreement attached to Chapter VII of the same treaty was the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code).

In addition to these international arrangements, Turkey imposes additional rules for ships transiting through Bosphorus in order to avoid accidents. To name a few, these rules include traffic separation schemes, the accompaniment of a maritime pilot, the prerequisite of giving Turkish authorities details about the ship's cargo and sailing plans. A source of contention between Turkey and other Black Sea littoral states throughout the 1990s, these laws led to disagreements which were resolved after the IMO weighed in and found a compromise, which was in line with Turkey's stance to some extent.[45]

The distance between the Asian and European sides of the Bosphorus does get very narrow. To give some perspective, while the effective range of an RPG, for example, varies between 300 and 500 meters, the Bosphorus can get as narrow as 760 meters, in other words a ship transporting hazardous material would be as close as 380 meters to the shore. Moreover, even though Turkish authorities managed to impose restrictions on Bosphorus traffic, such as temporarily stopping North-South traffic to minimize the risk of an accident when a ship with hazardous cargo is passing through, most of the time, traffic between the Asian and European sides of the city do not stop entirely.[46] Smaller, touristic vessels often pay little heed to the bans, therefore enforcing a total ban through the use of the coast guard may not be feasible.[47]

The areas along the seaside are crowded with houses, anchorages and small fishing ports, all of which can be utilized by saboteurs to use explosive-filled dinghies or small attack boats against high-value targets in the Straits. Moreover, there are technological limitations to containing and salvaging nuclear and radiological materials from the sea in case of a spill, so the saboteurs do not necessarily need to sink or explode the cargo vessel to wreak havoc.

On the other hand, all means of maintaining security through obscurity have shortcomings. Obscurity can be achieved through acting as if the ship is not carrying hazardous material and allowing free traffic. The authorities may also choose to mask the radioactive nature of the cargo but stop traffic nonetheless. Alternatively, it can be achieved by sending decoy ships and stopping traffic intermittently. Allowing the free flow of traffic increases the risk of having an accident and hampers the ability to respond to a water-borne attack. When Turkish authorities temporarily stop traffic, this news is relayed to all ships planning to cross the Straits[48]and hence warns potential attackers of a high value target. Using decoy ships means more frequent traffic closings, increasing travel costs for transportation companies using the Straits and would possibly result in complaints against Turkey at the IMO.

As a precaution, the Russian company might protect its ships with armed guards. This is not unprecedented. In 1999, the shipment of 446 kg of mixed oxide fuel (MOX) from France to Japan was accompanied by a speed boat with thirteen armed United Kingdom Atomic Energy Authority members, equipped with assault rifles, side arms, bulletproof vests, gas masks, and three 30mm cannons.[49] Additionally, the Turkish Coast Guard would likely be given the task of defending ships' cargo during transit through the Straits. In some instances, the Turkish Navy could be called on to ensure a ship's safe passage.

The existing domestic and international legal framework on the transportation of nuclear and radioactive material holds sender, the operating company, responsible for all risks and damages to third parties.[50] However, it is beyond discussion that ex-post legal consequences and compensatory practices are far from constituting the essence of managing nuclear risks and incidents. It is important to understand the gravity of the inherent risks of transporting nuclear material through the Straits. From a security standpoint, the multiplicity of locations from which a land-based or water-based attack can come from and the inherent challenges of effectively stopping sea traffic in the Straits make any vessel transporting hazardous materials vulnerable to an attack. The leakage of radioactive fuel or waste to the sea can threaten Istanbul's population of over 14 million, inflict significant damage to the national economy, and harm Black Sea littoral nations, most of which rely on the Straits on a daily basis for their foreign trade.

Therefore, governments and businesses must address the problems of transporting fuel to and waste from Sinop and Akkuyu as soon as possible. As Ozbek suggests[51], a solution to transportation problem should include the drafting of a more comprehensive Environmental Impact Assessment (EIA) and involve the active participation of the Turkish Coast Guard, Navy, and Ministry of Transport, Maritime Affairs and Communication. Whether the authorities decide to use the Straits or find another alternative, it is vital to take proactive defensive measures rather than reactionary ones, as the results of a potential attack may be devastating and irreparable. Even if the responsibility of protecting a ship's cargo is left solely to the contractor, Turkish authorities should standardize the minimum requirements for defensive measures, such as the number of personnel, equipment, and assets.

Civilian and Military Response Capabilities

Established in 2009 under Law no. 5902, Disaster and Emergency Management Presidency (AFAD) under the auspices of the Prime Ministry is responsible for coordinating the response to Chemical, Biological, Radiological, Nuclear (CBRN) incidents.[52] AFAD is also tasked with decontamination and maintaining response teams and equipment ready at all times.[53] Twenty people serve in one CBRN team on a 24/7 basis in eleven cities, including Istanbul, while the expansion of CBRN response capabilities in another fifteen cities, including Mersin, is reportedly underway. Furthermore, teams of eight operate on a 24/7 basis under the auspices of the City Disaster and Emergency Directorates of AFAD.[54]

A CBRN Study Group operates under AFAD and deals with risk assessment, preparatory actions, and response measures. The group consists of two nuclear energy engineers, one civilian defense expert, one chemical engineer, one senior biologist, one economist, and one data preparation and control operator. Both nuclear engineers are reportedly trained on nuclear safety, NPP accidents, risk evaluation, and contingency planning.[55] While AFAD's CBRN Capacity Augmentation Actions cover improving the capabilities of the Turkish National Police, the Turkish General Staff is responsible for the development of its own capabilities and only cooperates with AFAD as a coordinator.

The development of radiological and nuclear response capabilities of the Turkish Armed Forces (TSK) can be traced back to late 1950s. After operating as a CBRN school under the aegis of the TSK for decades, the unit was reorganized as the Turkish General Staff's NBC School and Education Center Command in 2003. In addition to the school, a CBRN Defense Battalion was founded in 1998. The

battalion was incorporated into the school in 2006, which was reorganized into its current structure, the Turkish General Staff CBRN School and Education Center Command, one year later. It is currently situated in the Central Anatolian city of Konya and reportedly consists of fifty-five personnel.[56]

The school sets up 10-week training courses for conscripts. It also provides technical support to the Ministry of National Defence and the Turkish General Command's CBRN capability acquisition and modernization programs. Additionally, it provides education to civilian personnel that lasts between one to five weeks, organizing seminars, workshops, and conferences in universities on the topic of CBRN defense.[57]

There are two types of CBRN defense forces under TSK command. One is the CBRN Defense Battalion, which consists of three decontamination squads and three reconnaissance squads. The primary aims of the defense battalion is to direct CBRN defense, aid in the drafting of regulations and manuals regarding CBRN, and train all three branches of the TSK. Moreover, the main reason for the existence of these squads is to assist the army on the battlefield during wartime. They are trained to operate in areas that deal with high CBRN risk and are capable of operating at the squad level.

The second grouping is the CBRN Special Response Force (SRF)[58], which is a force the size of a company and consists of squads capable of operating independently. The Special Response Force forms the backbone of TSK's CBRN reconnaissance, forensics, defense, and response capability and may also assist in civilian efforts. Initially, SRFs consisted of dual tasked[59] individuals, which meant that they could not commit to CBRN efforts full-time and often had to be relocated after several years, resulting in a lack of truly specialized and experienced CBRN response teams. Furthermore, even though all of Turkey's CBRN legislation and planning was in accord with NATO, Turkey's CBRN equipment could not be considered top-notch until fairly recently[60].The situation has improved after the branch's relocation to Konya in 2012. Staff became permanent and equipment was renewed with off-the-shelf technology. As things stand now, TSK's CBRN doctrine, equipment, and capabilities are compatible with NATO. The SRF has airlift capabilities and is capable of responding to any event within Turkish borders in less than 24 hours[61].

The CBRN SRF can also be utilized to aid civilian operations. According to AFAD's regulation on the Duties over Chemical Biological, Radiological and Nuclear Dangers, the TSK is responsible for coordinating and following up on the "National CBRN Risk Analysis" in conjunction with the Ministry of Science and Technology; Ministry of Environment and Urban Development; Ministry of Foreign Affairs; Ministry of Food, Agriculture, and Livestock; Ministry of Customs and Trade; Ministry of the Interior; Ministry of Forestry and Water Affairs; Ministry of Health; the Turkish Atomic Energy Authority; and governorships. TSK also had the responsibility to aid civilian CBRN defense and response efforts on demand. Faced with increasing demand for its CBRN response unit, TSK later added a condition requiring civilian authorities to apply to TSK first instead of applying directly to CBRN SRFs for help. The Armed Forces is also tasked with "reporting intelligence, speculations and reports about smuggling, terror and sabotage acts conducted with the use of CBRN weapons, material and waste with such properties."[62]

Under its current mandate, the TSK is not responsible for helping private companies. Therefore, it is unlikely that CBRN SRF resources will be utilized to protect the transit of fuel and waste to and from the country's prospective NPPs.[63] Although the Armed Forces' CBRN resources may – and should – be utilized to

draw NPP contingency plans, their current numbers alone could not ensure the security of NPPs. Protecting the physical security of NPPs would not be the best use of SFR talent. The primary purpose of having security measures in the first place is to prevent attacks against a nuclear facility or intercept adversaries *before* they cause a nuclear catastrophe, not after, as the damages resulting from an attack on the nuclear operation may be severe and irreversible. This makes designating and training permanent staff in charge of taking precautionary defensive measures, and establishing a clear chain of command between the agencies responsible all the more important.

For the very same reason the defensive and precautionary measures taken to secure nuclear sites and materials must be seamless. The criteria of success in this regard is not thwarting most attacks but preventing all of them. The government and security forces need to adopt zero-tolerance policies regarding nuclear security procedures.

Turkish regulatory agencies should ensure that on-site defense and security measures are set up to reflect the surrounding threat environment, but the government is primarily responsible for organizing the off-site response and planning reinforcement capabilities. With the exception of the rather improbable case of a debilitating state-led attack, which is inspected in more depth in the antecedent chapter, Turkish security forces should be able to fend off potential adversaries. The more likely adversaries will most likely be a small number of attackers equipped with a variety of weapons, such as long barrel rifles, RPGs, mines, and VBIEDs, and tactics to ensure their success. Therefore, it is not necessarily the size of the off-site response and reinforcement forces led by the Gendarmerie that matters but rather the rapidity of their response, their uninterrupted communication with on-site first responders, and their ability to deal with sophisticated asymmetrical threats. Moving towards a rapid reaction force instead of a bulky stationary troop concentration would also be more logical in terms of defense economics.

INSIDER THREAT AS A JOINT AREA OF RESPONSIBILITY

Overall, the Turkish government and the project companies may have clearly defined responsibilities, with little intersection for providing off-site and on-site security respectively. The same may also be true, although to a lesser extent, for securing nuclear fuel and waste during its transit. Still, there is one major area where the sides would be forced to cooperate in and have joint-responsibility for, and that has to do with the personnel that will be involved in the nuclear operation – most notably those that work in the facility, which will be referred to henceforth as insiders.

The involvement of insiders in any given sabotage or theft attempt dramatically increases the likelihood of success. Insider "problems" represent a risk that is ever present in all organizations including nuclear facilities. It is not always easy to recognize threats on time even though there might be red flags which may appear obvious in retrospect. Hence, relying on a one dimensional single layer security arrangement focusing heavily on a particular element of the security system is not advisable. Even when such, seemingly air-tight, arrangements are in place, it is important to keep in mind that the possibility that rules may not be followed or ignored is ever present. Furthermore, these contraventions do not always have to involve malicious intent they may occur out of "other complex reasons" and not only can create risks themselves but may represent and create opportunities for pernicious insiders and/or outsiders. Insiders do not have to participate directly in attacks themselves to cause great harm. They can provide bits and pieces of sensitive information gradually over time until an outside force figures out a facility's vulnerabilities and can calculate the ideal time for an attack on nuclear material in transit or the facility itself. Furthermore, facility personnel, construction workers, and maintenance workers could be loyal employees in the beginning but can be "turned" or coerced later on. Organizational culture and employee satisfaction stand out as other elements that are potentially very decisive in this regard. All in all as Bunn and Sagan point out, "threats come in diverse and complex forms" and it is important to constantly assess and test the risks and the system "as realistically as possible".[64]

The vetting practices of the MIT, the Turkish intelligence service, and the intelligence gathering of military and police forces will play a decisive role in whether potential insiders can embed themselves in the Turkish NPPs even though they cannot be expected to solve the problem or eliminate the risk stemming from threats related to insiders. Furthermore, some facility employees in Akkuyu will be of Russian origin, requiring Turkish agencies to cooperate with their Russian counterparts. As the facility employees may transform into insiders over time, cooperation between Turkish and Russian agencies, as well as with the project company and the security company that it hires to provide on-site security throughout the construction and operation phase of the facility plays a crucial part. As this will also be the case for the Sinop NPP, the Turkish government and relevant agencies should begin negotiating with their counterparts on the framework of cooperation in this field.

In-Depth Security: Existing Institutional Obstacles

Any adversary daring and capable enough to strike a nuclear power plant would meticulously study and attempt to exploit the inherent vulnerabilities of the facility's design and the security routines executed by its operators. Therefore, one of the most if not the most important aspect of any given security culture is its ability to evaluate and review itself. In the absence of robust evaluation and review procedures such as force-on-force exercises, these inherent blind sides would remain exploitable opportunities. To ensure that this is not the case, relevant criteria for the measurement of security effectiveness should be established. On this point, the Turkish institutions that are to be considered as primary stakeholders include the General Staff, Gendarmerie General Command (and as an extension the Ministry of Interior), Ministry of Defence, Turkish Atomic Energy Authority (TAEK), and the Prime Minister's Office. Other relevant governmental agencies, including the Ministry of Energy and Natural Resources and the National Intelligence Organization (MIT), could play a supplemental role. The lessons learned of the global nuclear industry, nuclear power nations and recommendations of international organizations would be important guidelines for establishing these criteria.

The second task is to periodically enforce a robust assessment of whether the criteria are being met or not. In the current Turkish institutional setting, this would be problematic. For one, the independence of TAEK is debatable. The president of TAEK is for instance directly selected by the prime minister and appointed jointly by the president, prime minister and the Minister of energy. Political authorities do enjoy budgetary and organizational control of TAEK. Hence even if a given regulator may appear independent on paper, it may not be independent de-facto due to political pressures. Furthermore, Atiyas for instance argues that transparency and accountability (both of which TAEK lacks) of the regulator are important components ensuring its independence. Furthermore, public scrutiny of a regulator's decisions causes the regulator to take its job seriously, according to Atiyas, and increases the overall quality of its decisions[65].

Tasking an agency entrenched strongly in the existing bureaucratic system with this job would likely result in the continuation of the endemic groupthink plaguing Turkish decision-making today. Regardless of whether it is done through empowering TAEK or establishing a separate governing body, the end goal should be the establishment of an agency that is independent (in terms of budget, government control over the appointment of members, and influences from the nuclear project companies), immune to political influences and transparent enough to resist being corrupted by the facility operators.

Competence is one of the key criteria for fulfilling this duty adequately. In this regard, an area of concern is the extremely limited number of technocrats, security personnel, scientists, and officials well-versed in nuclear safety and security in Turkey. The lack of knowledgeable people limits the competence of any agency tasked with evaluating and reviewing the facility's safety and security procedures.

According to a final report of a nuclear technology transfer conference held under the auspices of the Presidency of the Turkish Republic in 2012, between 1962 and 2010, only 315 undergraduate, 615 graduate and 135 PhD students have graduated from nuclear studies.[66] Furthermore, a number of these students have branched off to areas that would be of little practical use in the nuclear field or have moved to other areas of study and vocation. Although Turkish students are being trained as part of Turkey's deal with Russia in Russian universities in these fields, as most of the students will be employed in the operation of the facility itself, they will not be

effectively contributing to the capabilities of an independent regulator and auditor. Since it lacks this capability, TAEK has outsourced the evaluation process several times, the latest example being "the procurement of technical support services for review and assessment of construction license application for Akkuyu NPP", finalized on August 2014 with an agreement with UJV Rez, a.s. of Czech Republic.[67] Although this may be a viable alternative in the short run, it is not feasible in the long-run due to the sensitive nature of the information that is related to the security measures undertaken in the NPPs. In addition to ensuring that regulations are being properly enforced, an indigenous capability is vital in both drafting more sensitive nuclear safety and security measures, and being able to coordinate emergency response measures in any given crisis scenario.

On a higher level the regulatory framework becomes critically important as it provides the framework for threat and risk management. Rosatom representatives have also been vocal about Turkey's short comings on that front.[68] Overall, the TAEK website hosts over a few dozen regulations, guidelines, laws, and directives on radioactive and nuclear security.[69] According to the website, there are currently two pending draft regulations on nuclear contingency plans. The first is the Regulation on the Principles and Procedures for the Acquisition of Equipment for Nuclear Facilities and the Approval of Manufacturers and the second is the URAP – the national radiation emergency plan. Most of the regulations guiding Turkey's prospective nuclear program are compatible with international standards and are in line with Turkey's non-proliferation and nuclear safety commitments. Considering the country still has several years before its nuclear facilities are built and operational, the authorities have ample time to draft new regulations if needed.

Regulations are just the tip of the iceberg, though. Similar to ensuring that the project company abides by the predetermined security measures adequately, the ability to enforce regulations guiding all aspects of the country's nuclear program is perhaps even more important than setting the regulations in the first place. In In this case, enforcement depends on the actual power of the presiding authority over state bodies, in addition to the private companies involved in the NPP. In effect, this governing body should be able to influence relevant ministries, government agencies, and security forces to ensure the conditions set forth in the regulations are met. Currently, there is no Turkish agency that can meet these requirements. For example, it appears that TAEK is the primary authority over nuclear matters whereas AFAD is in charge of CBRN emergency response but in a given contingency scenario, neither one can give actionable orders to the military which has the actual capability of responding to a potential threat. As such in the existing horizontal decision-making and enforcement structure, cooperation between agencies is hampered by bureaucracy and issues with delegation of authority. Since Turkey lacks a U.S. Department of Homeland Security type of organization that can enforce regulations vertically, the issue of security in Turkey does not challenge conventional ways of thinking and practice about security.

In addition to influencing government agencies and private businesses, the envisaged governing body should be able to instruct utilities and companies involved in the operation of the nuclear power plant. For financial concerns, these bodies are primarily interested in making and keeping the NPP operational as soon as and as long as possible. In case of an emergency, utility companies cannot be categorically assumed to prioritize public health over financial costs. Private companies may try to preserve as much of their assets as they could when responding to a crisis and may not take drastic measures that could sacrifice their equipment. In case of a conflict of interest there is need for a strong agency

that will prioritize public health and safety. In order to do this, the agency needs leverage over companies, such as having the authority to stop the NPP's operation or revoke the contractor's license.

The proposal for the new "Nuclear Energy Law" that reportedly proposes establishment of a "Nuclear Regulation Authority" is said to be in the pipeline with the office of the Prime Minister. This new Authority will allegedly be endowed with powers that seem to be very similar ones argued for in this paper. The Authority is assumed to replace TAEK, whose Director and top officials will be released of their duties and TAEK will be transformed into a research only organization. The Authority will not be responsible to any other public authority or individual with full administrative and financial independence. Furthermore, the decisions of the new Authority will be final and cannot be supervised for appropriateness. The proposal states that the new regulatory institution will not be subject to Law No. 4734 on Public Procurement, Law No. 2886 the State Tender Act and Law No. 5018 on Public Financial Control and Management as well. It will stipulate the "technical, juridical, administrative and financial scope of licenses and permissions that are to be provided regarding the confirmation of the location, construction, operation, decommissioning of nuclear installations and radioactive waste facilities". Moreover the issue of responsibility on "nuclear accidents" seems to be resolved according to international norms and rules that, in the main, impose the liability strictly with the operator.[70] It should also be welcomed that the law reportedly entails a clause on prohibition and criminalization of nuclear weaponization by banning the production, import, export and possession of nuclear weapons, explosives and radioactive dispersion devices.[71]

Despite these positive amendments, the proposed law exempts Akkuyu from various laws and regulations such as the Public Tender law and Public Fiscal Management and Control law. It is evident that in order to have a security and safety regime that meets best international practices, what the country needs is more transparency and uniformity, not the creation of new exceptions and bending rules further. The issue of transparency also stands out when it comes to the parts of the law that regulates secrecy. It appears that in its current draft, the proposed law does little to alleviate the current opaqueness of Turkey's nuclear culture. It should be clear that most of the concerns with the proposed framework lie largely with the political and public administration culture in Turkey and partly with the peculiarities of the current government and its leadership.

Whether it comes at the form envisioned by the reported Nuclear Energy Law or not, the administration of the country's nuclear program is in need of reform. Still, this alone in itself would not be sufficient. On the micro level, NPPs are critical facilities for the country, but on the macro level they are also integral parts of the critical national infrastructure and cannot be isolated from the overall CEI/CNI framework.

Present day attitudes toward large scale contingency management draw heavily from the lessons of 1999 İzmit earthquake that resulted in the death of 17,000 people and left an additional half a million people homeless. It should be emphasized that no existing security risk related to CEI is comparable in scale to an attack on Turkey's nuclear infrastructure. An adequate culture of security, that is inherently aware of the intricacies of nuclear power, cannot be said to exist. The general mindset predicates a rather wholesale approach. For example; the predominant culture of Turkish institutions charged with tackling security

threats to CEI is to treat the information systems and transmission lines operated by power plants as closed systems. The gravity of an attack on CEI is currently evaluated by using a formula based on the amount of energy generated or passed through individual systems. It also calculates the national grid's ability to replace or substitute a given amount of energy versus the total amount of energy supplied by the CEI overall. Undeniably, such an approach almost completely disregards the extent of damage that can result from attacks on NPPs and instead fixes threat assessment on a mere supply and demand formula.[72] Therefore, Turkey's current mentality does not fit the nuclear security culture or the depth in security perspective espoused by the IAEA.

Furthermore there is no coordinating structure for critical infrastructure at the national level. All agencies and ministries try to deal with issues that they assess as befalling under their jurisdiction. A significant down side of such an approach is that it not only creates conflicts of interest among institutions but also inevitably gives rise to "gray zones" for which no one assumes proper responsibility. In the case of pipelines, the gendarmerie and police forces are both responsible for protection and security. The legal framework of the arrangement, however, is the existing Home Country Agreement. Nevertheless, no such agreement, at least yet is known to exist for the country's nuclear deals. Therefore, ultimate responsibility is ambiguous. In order to overcome these challenges, an effective independent coordinating authority tasked with the protection of the critical infrastructure at the national level should be established. It goes without saying that this body would only be effective to the extent that it includes the inputs from all key stakeholders in its decision making.

CONCLUSION AND RECOMMENDATIONS

The fundamental issues facing Turkey can be summarized as follows:

1) Recognition of the need to structure and encourage the nuclear security culture and establish an in-depth defense strategy,

2) Definition and prioritization of critical electrical/national infrastructure

3) Determination of clear procedures of ownership and allocation of responsibilities; establishment of a truly independent and capable regulatory authority to oversee the practice of national and international obligations,

4) Management of relations with Russia and Japan within the framework of nuclear cooperation.

Nuclear materials and infrastructure are high-risk targets. One successful attack can have a tremendous impact on the country's population, economy and environment. Risk increases when nuclear and radiological materials are in transit, when defensive measures are limited, and when material is being transferred through multiple locations. In such areas offense has an advantage over defense, and the risk is especially higher while the material is transited through high-priority areas such as the Turkish Straits. Therefore, the measure of success for the

defense of Turkey's nuclear infrastructure is not the paucity of successful attacks but rather their complete absence.

Hence, an intelligence-driven defense approach that prioritizes preventive measures is as important as the impregnability of an NPP's physical defenses. This fact is no better exemplified than in the case of insider jobs. Even the most impregnable defenses are rendered useless if the culprits are already inside. Inter and intra-agency cooperation is an essential part of defending against inside and outside attacks. Furthermore, cooperation with contractors and the intelligence agencies of foreign countries – given that some NPP employees are foreigners – is imperative. This requires a fundamental change of the current intelligence and security culture in the country. These groups do not usually see eye-to-eye on issues related to organizational hierarchy, chain-of-command, relinquishing authority, and taking over responsibility. In fact, these issues are a source of competition, inhibiting cooperation to reach its full potential.

The lack of a clear legal framework that can establish these organizational structures and the ambiguity of regulations further exacerbate the lack of cooperation. Moreover, although preventive plans have a place in Turkish National Police operations, they do not play a major role in military thinking. There are myriad regulations that security forces can resort to when planning their responses, including those directly related to nuclear security and those that provide a larger framework, such as the 1988 Regulation on Protection Against Sabotage[73] and the Anti-Terror Law.[74] It is important to note, though, that these laws mainly envision fixed, protective measures. When drafting critical national infrastructure policies, Turkish legislative bodies must include concrete plans of incorporating an intelligence-driven defensive culture.

Yet, intelligence and pre-emptive action does not guarantee protection from all attacks. When it comes to protecting a facility against physical threats, the overall capabilities of Turkish security forces are only of secondary importance compared to the competence of on-site security forces which would act as the first responders to any given attack. Based on the existing practices of other fields of critical energy infrastructure and the existing framework provided by the inter-governmental agreement between Russia and Turkey, on-site security will most likely be provided by a Turkish private security company that will be contracted by the respective project companies. This will possibly be the case for radioactive and nuclear cargo during its transit to and from the NPP. Prevailing legal and regulatory ambiguities complicates the situation.

Although ensuring on-site security is the responsibility of the project companies, public authorities should develop a more comprehensive approach for ensuring the security of NPPs. First, authorities should set up comprehensive requirements similar to those adopted by the U.S. after the September 11th attacks for the basic capabilities, numbers, equipment, and codes of conduct of on-site security personnel. Second, government agencies should make sure that security personnel are adequately trained and preferably conduct regular force-on-force exercises based on realistic contingency scenarios, including low probability but high impact attack scenarios. Third, the government must clarify the legal ambiguity surrounding issues including but not limited to: which government agency is responsible for coordinating communication among project companies, on-site security companies, Turkish security forces, and Turkish administrative organs; who is responsible for inspecting the preparedness of on-site security forces. These questions and the contexture of the cooperation between Turkish security forces and private security personnel also apply to cases when nuclear and radiological

material in transit. Furthermore the issue of intelligence sharing presents another ambiguity. It is certain that on-site and off-site security forces and intelligence agencies of both countries will have to share actionable intelligence, yet there are currently no known mechanisms in place to make this possible.

Being the second largest army in NATO with access to superior military technology and decades of experience combating terrorist organizations, Turkish security forces are well equipped to repel potential attackers. They can assist in off-site intervention that will aid on-site security forces. The issue then is not the size of security forces but other factors, such as the rapid response capabilities of these forces, their training in countering potential threats, their equipment for various contingencies, and their uninterrupted communication with the on-site first responders. The vital point here is that the off-site responders should be trained and regularly exercised to deal with various scenarios, including threats that are specific to NPPs and that envision competent adversaries.

Although Turkey has some civilian and military personnel trained in dealing with CBRN scenarios, most of these personnel are trained to deal with CBRN attacks after the fact and hence may not play an effective role in preventive/precautionary security measures in their current capabilities. The only force that might have an added role, at least in training, supervising, and maybe supporting off-site and on-site responders is the CBRN Special Response Force of the Staff General.[75] Yet, due to their limited size and abundance of responsibilities, the CBRN SRF is not a substitute for a rapid reaction force trained to respond to contingencies specifically involving nuclear facilities. An effective off-site security force would require communication with the military, Gendarmerie General Command, and the police; the sharing of government intelligence; coordination with on-site security personnel; and the calling of backup from proximate security forces if needed.

Turkish authorities should accelerate efforts to define and reframe the current understanding of critical national infrastructure. Since most of the CNI is owned or operated by private companies and is integrated into larger systems like the electricity grid, efforts to protect CNI includes the participation of the private sector and involve clear expectations from each stakeholder. Given the crucial role of the operator in ensuring the physical security of the plant, the government should develop its guidelines in consultation with the industry.

As shown in this study, the issues surrounding Turkey's nuclear ambitions are manifold. The combination of no effective oversight initiatives by civil society and the absence of a serious anti-nuclear lobby have led to lackadaisical initiatives from the public sector. At this stage, Turkey seems to be largely ignoring the special circumstances surrounding the intricacies of nuclear critical infrastructure. Although Turkey has experience protecting other types of CEI like oil pipelines and power grids, the country has little exposure to large-scale contingency strategies and crisis management. The current agreement with Russia does not seem to allow Turkey to replicate the existing structures and procedures in effect for oil pipeline security. The Turkish government should highlight the ways in which nuclear facilities are different from the rest of the CNI and focus on the specific vulnerabilities and risks for its prospective nuclear power plants.

Overall, Turkish government agencies need to be more active in the decision-making process regarding Turkey's future nuclear infrastructure. In part due to existing bureaucratic ambiguity, Turkish security forces and regulatory agencies have failed to step up and contribute to the debate over the country's nuclear future. This is best exemplified by Turkey's approval of the Akkuyu EIA without

first clarifying how nuclear fuel would be transported and what security measures it would entail. Because these issues are much bigger than mere economic and logistical concerns, Turkey should play a more active role in making these decisions rather than simply reacting to events after they unfold. The country should ensure that the Preliminary Safety Analysis Report (PSAR) lays out detailed plans for using the Turkish Straits and other alternatives as transit routes. Although the responsibilities for risks and threats concerning design, construction, start-up, operation, natural disasters, terrorism, supply security, nuclear waste, deactivation, and decommissioning lies with the Russian operating company, since the disruption of any of these operations or the inability of the operating country to fulfil its responsibilities may result in damages to Turkey, the government cannot simply trust the continuing goodwill and commitment of the Russian company and remain passive.

The regulator is the first and most important step to creating a security culture that emphasizes human safety over economic gains. In order to ensure this, the regulator must insist on stringent security measures, and should be able to resist pressure from the project companies, utilities and government authorities. More importantly, the regulator must be able to properly enforce public and private agencies to act appropriately. Similarly, if regulations are not fully implemented during the operation of the facility, the regulator should be able to stop and seal the facility, or, in extreme cases, cancel the project company's license until the necessary measures are implemented.

Independence, accountability, and transparency are the pillars of ensuring the strength and resilience of the regulator. Allowing public scrutiny is akin to turning the public into stakeholders and supervisors that ensure the quality of the regulator's decisions. Furthermore transparency helps to insulate the regulator from political pressures by allowing the public to have a say in the matter. This is especially relevant as the ruling AKP government considers NPPs as indispensable to the national interest and is not known as the champion for the independence of regulatory authorities.

More pressing than passing regulations is the need to transform the current culture of security elite in dealing with challenges to CNI, especially with nuclear facilities. Another major challenge is the need to bolster the capabilities of the supervisory body. The new set up will inevitably have to address the issue of incorporating TAEK 's existing capabilities, while enhancing its own without causing inefficiencies due to duplication of efforts on developing ones that already existing within TAEK. In addition to building its strength as a regulatory body and assuring its independence, TAEK's scientific and technological expertise should be reinforced for handling the job more competently. Outsourcing these efforts is only a temporary stop-gap. Turkey must boost its domestic scientific and technological capabilities and accumulate knowledge so that the country can dictate policy in the long run.

Although Turkey still has time to enact new regulations, it must reinforce and restructure existing capabilities and regulations as soon as possible, ideally before the first stone is set in Akkuyu. Security and safety challenges surrounding the facility begin even before the first NPP is operational. Even if the construction plan is sound, any unwitting mistakes or deliberate errors by malevolent insiders will be detrimental to the facility's performance and the country's nuclear security in the long run. Therefore, Turkey and its partners must continuously prioritize security measures to every aspect of the country's nuclear projects. Turkey's continued cooperation with international organizations will be vital for the soundness of its nuclear future.

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Nuclear Security and Turkey: Dealing with Nuclear Smuggling

Prof. Dr. Mustafa Kibaroğlu

Department of Political Science and International Relations,
MEF University

Board Member, EDAM

INTRODUCTION

The number one security threat perceived by the authorities in the West, particularly the United States, is nuclear terrorism. In order to prevent such a contingency, world leaders gathered together in 2010, 2012, and 2014 in Washington, D.C., Seoul, and The Hague, respectively, to discuss the necessary measures to keep nuclear and radiological material away from the reach of terrorist organizations.

One way to prevent nuclear terrorism is to deal with the smuggling networks that are directly or indirectly responsible for the acquisition of the sensitive and hazardous materials. Turkey, which is situated at the crossroads of Europe and Asia, is crucial to the international fight against smuggling. Turkey's role is significant not only for maintaining a safer and more secure world order but also for its own national security. Turkey has been exposed to terrorist attacks for many years.[1] The probability of sensitive material falling into the hands of terrorist organizations bent on attacking Turkey cannot be underestimated by any responsible statesmen. Hence, Turkish authorities have, since the beginning, paid the utmost attention to the prevention of trafficking of nuclear and other sensitive material.

Long before world leaders discovered the need for concerted action against nuclear trafficking, the Turkish government started to take substantial steps in the early 1990s, when there was an increasing number of attempts to smuggle sensitive nuclear material from the former Soviet republics to buyers in the Middle East and East Asia. Many of the smuggling attempts made in Turkey, Black Sea countries, and Caucasus were thwarted by Turkish security units collaborating with Interpol.

This paper will first profile the threat posed by nuclear smuggling by making references to the presence of non-state actors that have attempted to acquire weapons of mass destruction and the materials used in their manufacture. Next, this paper will present the extent of Turkey's involvement in nuclear smuggling incidents over the past two decades. Experts in the field acknowledge, "Turkey is neither the source nor the target country, but Turkey's proximity to the conflict regions, strategic location between Europe and Asia, and years-long struggle with terrorism put forward the notion that the CBRN threat cannot be ignored".[2] Then, this paper will outline the measures Turkey has taken to combat nuclear smuggling, which can be grouped into four broad categories: (1) measures to enhance inter-agency cooperation and training & education activities; (2) measures to implement and execute Turkey's treaty obligations in cooperation with the IAEA; (3) Turkey's voluntary contributions to multilateral initiatives aiming to stem nuclear proliferation; and (4) Turkey's initiatives, alone or together with regional states, to tackle nuclear smuggling activities. Finally, this paper will make recommendations for what Turkey can do in the future.

The Profile of the Threat Posed by Smuggling of Nuclear Material

With the end of the Cold War, the strategic context that had long rested on a "delicate nuclear balance" had come to an end.[3] Achieving a lasting peace and maintaining international stability had thus become more difficult due to the proliferation of actors that appeared at the center stage of world politics. The so-called "non-state actors" (i.e., transnational terrorist organizations), which have developed indigenous command, control and communication structures, have started to become influential in the international arena. The emergence of these political, quasi-military entities has disrupted the stability of the international system and threatened international peace and security with violent attacks on innocent populations.

For instance, the Japanese cult Aum Shinrikyo has a long record of criminal activity, including the Sarin gas attack in the Tokyo subway in March 1995.[4] Experts in the field believe that the cult is composed of a worldwide network of scientists and experts working in various fields, ranging from medicine to engineering, archaeology to the natural sciences.[5] Similarly, in September 2001, when the world media covered the attacks on the World Trade Center in New York and on the Pentagon in Washington, D.C., reports broke out about another non-state entity, namely Al Qaeda, which had also established a worldwide network of small cells in many countries with the involvement of thousands of people from diverse personal and professional backgrounds. Al Qaeda's efforts to acquire the means to develop weapons of mass destruction have been documented based on information gathered in Afghanistan during US military operations.[6]

More recently, another non-state actor, the "Islamic State of Iraq and Syria (ISIS)," has entered the picture with its extremely violent acts. ISIS moved swiftly inside the conflict-laden territories of Iraq and Syria with military equipment they acquired from the Syrian and the Iraqi armies, which had been in disorder for many years. Now, ISIS controls large portions of these two countries and has proclaimed Sharia rule over its "sovereign territories," naming it the "Islamic State." Looking at the types of crimes, some of which could be characterized as genocide, committed by ISIS in the summer of 2014, the probability of their using these weapons of mass destruction, if acquired, cannot be underestimated.

The militia groups, or the quasi-military units who are active in eastern Ukraine, pose no less of a threat to regional and international security with the capabilities that they may have already acquired from the stockpiles of weapons and munitions that they have been sitting on. It is difficult to make an accurate assessment as to what would their intentions are in sustaining an uprising against the central authority in Kiev and to what extent they will push their claims – with the undisputed support of the Russian Federation and how this could escalate the ongoing conflict. It is therefore necessary to keep an eye on their activities.

The list of non-state actors is not exhaustive and is composed of groups with different objectives, including those who uphold religious extremist principles to racist militia groups. Security analysts' main concern regarding non-state entities is their ability to gain access to all sorts of weapons and weapons-usable material, with particular emphasis on chemical, biological, radiological and nuclear (CBRN) material. Should this happen, maintaining peace and stability in the world will become even more difficult.

Considering that these and other would-be terrorist organizations around the world do not have sovereign territories to install large facilities housing the necessary technological equipment and ingredients to manufacture sophisticated weapons, their military capabilities could be acquired in two ways: "war by proxy" and arms trafficking.

First, a sponsoring state could provide shelter, weapons, munitions, and training to the leadership cadre and foot soldiers of terrorist organizations, thereby manipulating the terrorist organization to achieve its own political objectives. This is what is known as "war by proxy" in the literature of military-strategic studies. There were strong accusations about some countries having resorted to such proxy strategies, especially during the Cold War period when the fear of the escalation of bilateral or regional conflicts to a hot confrontation between the two nuclear superpowers suppressed the ambitions of regional states to wage wars openly against their rivals.

In the absence of a sponsoring state, the second way a terrorist organization can build its military capabilities is through the illegal arms trafficking network, some of which may already be under their control. The presence of illegal networks that control the trafficking of drugs, arms, munitions, and human beings is an undisputed fact. Some of these networks may be categorized simply as criminal networks whose primary motivation is to gain large amounts of money and privileges, while others have been created specifically to sponsor terrorist activities in order to achieve their political or religious objectives.

The Eurasian landscape, encompassing Central and Eastern Europe in the west, Siberia and China in the east, and the northern tier of the Middle East in the south, is comprised of different nations with different cultures and thus different sets of political relations, some of which have been and still are confrontational. There is an accumulation of all sorts of light and heavy conventional weapons as well as nuclear, chemical, and biological weapons in the arsenals of many Eurasian countries. These weapons have been kept in thousands of facilities and storage sites dispersed across the huge landmass, some of which have supposedly not been adequately guarded in the past[7] and possibly today as well. These and other characteristics of the region make it suitable for illegal transnational networks to exploit them for trafficking of weapons and weapons-related material that could destabilize the region.

Emergence and Evolution of Nuclear Smuggling Incidents

The collapse of central authority in the former Soviet Union's fifteen republics has resulted in security deficits in critical installations, such as nuclear power and research reactors, weapons manufacturing facilities, material storage sites, and research laboratories where sensitive and hazardous nuclear materials are kept. The lack of proper safety and security measures in hundreds of these facilities all over the vast lands of the former Soviet Union enabled organized crime networks, smugglers, and opportunistic nuclear workers to have unauthorized access to these materials.[8]

Initially, incidents of the trafficking of nuclear material were generally seen in Central and Eastern Europe, where smugglers sought to find buyers for what they carried all the way from former Soviet territories with the expectation of making a fortune. However, police officers posing as buyers in countries like Germany,

Poland, and the Czech Republic have thwarted many of these attempts and led to the arrest of the perpetrators. In some of these arrests, significant amounts of nuclear materials, in most cases low enriched uranium (LEU), were seized.

The first cases of the proliferation of nuclear trafficking in the former Soviet Union involved the theft of approximately 1.5 kilograms of highly enriched uranium (HEU) from the Luch Scientific Production Association in Podolsk, Russia, in October 1992. Between 1992 and 1995, the police in Europe foiled some ten attempts, such as in Munich, Tengen, and Landshut in Germany; Vilnius in Lithuania; and Prague in the Czech Republic. Several attempts have been made in Russia, such as the ones at the naval base storage facility in Andreyeva Guba and the naval shipyard in Sevmorput.[9]

For a number of reasons, many of the attempts of the illicit transfer of nuclear materials through Europe have failed to achieve their objectives. One reason was the preparedness of the European police agencies to deal with the potential influx of such materials from their eastern neighbor.[10] It is interesting to note that the documents coming out of the trafficking court cases suggest that the profile of smugglers exhibited stark differences. For instance, on the one hand, there were opportunistic nuclear workers who were dreaming of making a fortune overnight but had no experience with smuggling sensitive nuclear material. On the other hand, there were well-organized smuggling networks but they also had no experience in trafficking sensitive nuclear material.[11] According to Mahmut Cengiz, technology remains a critical supplement to police work. Dr. Cengiz divides smugglers into two groups: "well-connected professionals and small-time crooks, and often the former hire the latter to serve as couriers."[12] He also notes that while professional smugglers use connections and bribes to circumvent scanners, technology can catch or deter an amateur.[13] Hence, smugglers have committed many mistakes that facilitated the task of undercover agents who posed as buyers and arrested them.

A second reason for the diminishing number of attempts to smuggle nuclear material from Central and Eastern Europe was the lack of potential buyers in Europe who could make use of the nuclear material for a variety of purposes, such as clandestinely building nuclear weapons or crude explosive radiological devices. In addition, heightened security measures and the installation of sophisticated hi-tech devices, such as the radiation detectors at European border crossings installed in the early 1990s, forced the smuggling networks to shift their activities from Europe to the Caucasus and Middle East regions.

Intra-state and inter-state conflicts that erupted in the Caucasus and the Middle East at the end of the Cold War, including the Nagorno-Karabakh conflict between Armenia and Azerbaijan, heightened tensions in the Georgian districts of Ossetia and Abkhazia, and Iraq in the aftermath of the Gulf War following the August 1990 invasion of Kuwait. These conflicts aided the existing Eurasian smuggling networks, who took advantage of the disorder and instability in the Eurasian landscape. It is important to note that border controls were traditionally very lax in this region. Therefore, the risk of smugglers being arrested was significantly low or non-existent.

All of these factors shifted the focus of these smuggling attempts toward countries in Southeastern Europe, the Black Sea, the Caucasus, and the northern tier of the Middle East. It goes without saying that, being located at the epicenter of the regions where nuclear smuggling activities have gained pace, Turkey has become one of the territories that trafficking networks prefer as a transit route.

The Extent of Nuclear Smuggling Incidents that Involve Turkey

Reports about the first case of nuclear trafficking in Turkey appeared in the media as early as October 1993.[14] Before citing some of these incidents, however, it must be noted that there is a significant discrepancy between the reports in the media and the information provided by Turkish authorities in regards to the amount of nuclear materials seized during the anti-smuggling arrests in Turkey.

For instance, on October 5, 1993, it was reported that the Turkish police arrested eight people, including four Iranians, in Istanbul for allegedly trying to purchase 2.5 kg of Russian uranium from a Turkish professor.[15] The exact amount of nuclear material seized in that incident was 2.49 grams, which is indeed 1/1000 of the amount reported in the media.[16] According to Salih Güngör, then Head of the Istanbul Police's Anti-Smuggling and Organized Crime Department (KOM)[17], Russian "visitors" transported the uranium to Turkey, where they sold it to Turkish nationals. While the Turkish police were trying to determine whether the four Iranians were connected to the Iranian secret service, an official at Iran's Consulate in Istanbul responded to the allegations by saying that the Iranian state had absolutely nothing to do with the incident.[18] It was also reported that the uranium was to be sold for $40,000 per gram. The uranium, analyzed at the Çekmece Nuclear Research Center of the Turkish Atomic Energy Authority (TAEK) near Istanbul, was enriched to 2.5-3.5 percent. Erol Barutçugil, Deputy Head of the Çekmece Nuclear Research Center, announced that the smuggled material was low enriched uranium and could not be used in the manufacture of nuclear weapons.[19]

Similarly, it was reported in July 1994 that the Turkish police detained seven Turkish suspects and confiscated 12 kg (26.45 pounds) of uranium. In this case, the exact amount of nuclear material seized by the police was 12.38 grams, which is again 1/1000 of the amount reported in the press.[20] It was also reported that the uranium, valued at about $853 million, was smuggled into Turkey from an unidentified country in the former Soviet Union.[21] Given the inconsistencies of the real quantities of the materials seized in some of these incidents, the figures concerning their monetary value are likely to be exaggerated as well.

In another incident reported on February 28, 1997, a Turkish national was arrested by an undercover policeman in İpsala, in Turkey's northwestern city of Edirne, with 509 grams of "uranium ore," worth about $800,000. Again, the media incorrectly reported that the material seized was uranium ore when in fact it was natural uranium.[22] Two other men were also arrested in Ankara on related charges. When questioned by the police officers, perpetrators admitted that they had bought the uranium in Georgia. According to sources from the Cekmece Nuclear Research Center, the weight and type of uranium was unprocessed and of no strategic importance.[23]

In addition to the media misreporting the exact quantities of nuclear materials seized in Turkey, TAEK officials also noted that some of the reported incidents had never taken place at all and that they were fabricated by media outlets. For instance, on September 8, 1998, it was reported in *The Moscow Times* that the Turkish police had seized 4.5 kilograms of "nonactive" uranium and six grams of "active" plutonium smuggled from Russia, which could be used for weapons production. They arrested eight people, including nationals of two former Soviet republics.[24] On September 28, 1998, Dr. Cengiz Yalçın, then TAEK's president, categorically denied press reports that plutonium had been seized in Turkey in

September 1998. TAEK's president Yalçın insisted that "no plutonium or high-enriched uranium (HEU) [had] ever been found in Turkey."[25] TAEK officials also confirmed during a recent telephone conversation that there was no such an incident at all.[26]

In the late 1990s and the early 2000s, as a result of intensifying attempts to smuggle nuclear material in the Caucasus, there was growing concern in the West, particularly in the United States, about the extent of smuggling of nuclear material in the region. In his *New York Times* article, Douglas Frantz argued that the United States had responded to these developments by sending millions of dollars' worth of detection equipment to several countries in the Caucasus region.[27] According to Frantz, the U.S. administration also provided training for border guards to learn to spot illegal shipments of nuclear material, and they helped improve security at nuclear plants and airports. Few smuggling incidents involved material that could be used to make bombs, and no successful attempts at smuggling weapons-grade material are known to date. Back then, the rising number of incidents and the strong belief that only a fraction of shipments were intercepted raised the level of anxiety in the US. Worries were exacerbated by lax border controls and the vulnerability of customs officials to bribes. In his article, Frantz stated the International Atomic Energy Agency (IAEA) provided figures "showing that the number of confirmed cases of nuclear smuggling had fallen in the rest of the world but had risen in Turkey, the Caucasus and Central Asia" in September 2001. Only 4 of the 104 cases from 1993 to 1995 occurred in this region, the agency reported, but from 1996 to 2001, 16 of the 72 cases worldwide occurred in the region.[28]

Between 1993 and 2002, of the 27 seizures of radioactive substances (mostly natural and low-enriched uranium) in Turkey recorded by the Database on Nuclear Smuggling on Theft and Orphan Radiation Sources (DSTO), 25 were due to police and intelligence operations and only two resulted from customs control. In the subsequent three years, Turkish authorities recorded 48 trafficking incidents, all but one resulting from radiation control at the country's newly equipped checkpoints on the borders with Georgia and Iraq. The majority of these cases involved radioactive sources or contaminated material found inside scrap metal shipped into the country.[29]

As in the previous cases of the media's misreporting of the facts and figures concerning the amount of nuclear materials seized, TAEK authorities also felt the need to provide clarification about why the number of incidents reported as nuclear smuggling cases is significantly higher than those that have actually taken place during that time period. Turkish authorities recalled that, in the aftermath of the first Gulf War in 1991, private Turkish firms and dealers in the metal industry imported a considerable amount of scrap metals from Iraq for various uses and applications. Some of the imported scrap metals were in some ways contaminated with radiological material. For instance, steel vessels used in the nuclear installations during the Saddam period were contaminated with uranium. Similarly, the engines of missiles or the Iraqi armory - which were either destroyed during the war, dismantled after the war by the IAEA and UNSCOM[30] inspectors, or looted by the people amid the chaos in the country – were also somehow mixed in with contaminated material. Hence, some of the shipments of scrap metals from Iraq contaminated with radiological material were inspected by customs agents on the Turkish-Iraqi border for thorough examination to check whether they involved significant amounts of radiological material that could be categorized as nuclear smuggling incidents.

Due to the increasing number of such cases over the years and the proliferation concerns of the United Nations, Turkey put a halt to the import of scrap metal from Iraq in 2005.[31] The Turkish government's decision was made as a result of consultation meetings convened at the Undersecretariat of Foreign Trade with the participation of representatives from the Turkish General Staff, Ministry of Defense, Ministry of Foreign Affairs, Ministry of the Interior, Ministry of the Environment and Forestry, Gendarmerie, National Intelligence Authority, Turkish Police, Customs, and TAEK. In addition to banning direct imports of scrap metal from Iraq, Turkey also prohibited the transit of Iraqi scrap metals to other countries through Turkey and the indirect import of Iraqi scrap metals from third countries.[32]

At the beginning of the 2000s, only two border posts had systems to detect radioactive material, both of which were donated by the United States. Locations without detection devices relied on visual inspections, a difficult task considering that a kilo of plutonium is compact enough to be concealed in a container the size of a soft drink can. On January 20, 2009, TAEK and the Undersecretariat of Customs signed a protocol regarding the installation of detection devices at border crossings as a measure against nuclear smuggling. The protocol envisaged comprehensive cooperation ranging from installing and operating radiation measurement systems to training and exchanging information between TAEK and customs.[33]

Currently, 48 border gates have detection systems produced by TAEK in its research centers in Çekmece in Istanbul and Sarayköy in Ankara. These detection systems are monitored by TAEK online to better respond to emergency situations in the shortest time possible. Moreover, more than 150 private companies operating in the Turkish metal industry purchased these detection systems from TAEK in order to separate the unwanted waste from scrap metal that may have been contaminated with radiation, thus causing health risks to their workers and damage to their machinery.[34]

From January 2001 to December 2005, a total of 40 trafficking incidents associated with organized crime fitting the INTERPOL and the FBI definitions were identified in the DSTO database.[35] Only one of these incidents reportedly took place in Turkey and involved two Turkish citizens.[36] During the period from January 2006 to December 2012, no smuggling of dangerous (i.e., chemical, biologic, radioactive, or nuclear) materials has been recorded in the jurisdiction of Turkish police. The Turkish Atomic Energy Agency reported that substances seized before 2006 had no material value and no qualities that could be used in the making of nuclear weapons.[37] Instances in which these smuggled goods were marketed to third parties for "fraud" purposes or purported to be radioactive were quite frequently the subject of investigations in the field of smuggling in hazardous substances. In most of these cases, substances claiming to be selenium or osmium, which are used in the industry sector, or even products like snake venom or red mercury were marketed. From the analysis reports obtained from authorities dealing with these substances, it is understood that these substances were not of the chemical, biological, radioactive, or nuclear substances defined in Turkish Penal Code 174. In 2009, six incidents involved in the smuggling of hazardous substances resulted in the seizure of substances and the apprehended suspects were subjected to judicial procedures for violating the Anti Smuggling Law no 5607.[38]

Measures Taken by Turkey in the Fight against Nuclear Smuggling

Over the last decade, Turkish government officials have taken a series of comprehensive measures in order to strengthen Turkey's capacity to deal effectively with the dangers associated with the possibility of nuclear materials falling into the hands of terrorists. These measures can be grouped into four broad categories.

The first set of measures aims to enhance the inter-agency cooperation within the Turkish state bureaucracy in collaboration with allied nations and friendly countries. These measures also involve providing education and training both at home and abroad to the relevant personnel at all levels in the civil and military bureaucracy and in Turkish academia.

The second set of measures relate to the proper implementation of Turkey's legal obligations stemming from its membership to international treaties and conventions. Some of these measures require intensive and long-term cooperation with the specialized agencies of the United Nations, such as the International Atomic Energy Agency (IAEA).

The third set of measures involves Turkey's voluntary contributions to the multinational initiatives that strive to halt the proliferation of weapons of mass destruction and fight against international terrorism.

The fourth category involves Turkey's initiatives in partnership with regional countries seeking to enhance the ability of state security units littoral to the Black Sea to fight illegal trafficking networks that use Turkey's territory in their criminal ventures.

Measures to Enhance Inter-Agency Cooperation / Education & Training Activities

On the topic of preventing the smuggling of CBRN materials under the KOM Department's coordination, 150 units of radiation measurement devices produced by TAEK's Research Centre Laboratories have been distributed to the KOM Units in 81 provinces and 32 districts pursuant to the protocol signed by TAEK and Turkish National Police.[39]

Turkish customs officials have been working an automated environment since 2001 and 99 percent of their data is saved and processed in a computerized network. Customs security has also been enhanced by the installation of advanced X-ray equipment. Turkey actively contributes to the work carried out by the IAEA and others to develop international standards and practical measures to monitor, intercept, and manage radioactive scrap metal. Turkey developed two informational handbooks, the "Instruction Manual of Radiation Detection System at the Border Gates" and "Nuclear and Radioactive Material Notification Form," for use at border crossings.[40]

In order to maintain a well-trained cadre of technical experts, TAEK conducted regular training courses on various aspects of nuclear security for experts from relevant agencies, including law enforcement customs officials, representatives from the nuclear industry, and academic institutions. TAEK's 2012 training

program included specific courses on the "physical protection of nuclear material and facilities" and "accounting and control of nuclear material." With Turkish and foreign participation, training courses on WMD terrorism were organized regularly by the NATO Center of Excellence – Defence Against Terrorism (COE-DAT), established under the auspices of the Turkish General Staff in June 2005 and accredited by NATO.[41]

In the same vein, the Ankara Nuclear Research and Training Center (ANAEM) was established in August 2010 to perform national and international training on radiation protection, radiation safety, nuclear power, nuclear safety, nuclear security and nuclear applications. ANAEM's main duty is to meet the manpower needs of the industry and public sector. ANAEM is also responsible for public information activities. Becoming an innovative and productive research and training center that meets the high standards of the international community is one of the many short-term objectives of ANAEM.[42]

Every year, ANAEM experts give special courses on nuclear safety and security-related issue to about 25-30 personnel from various bureaucratic departments, such as the police, the gendarmerie, customs, and the like. Those who attend the "training the trainers" courses, share their knowledge and expertise gained from these courses with colleagues in their respective institutions. In this manner, the total number of personnel trained by ANAEM, directly and indirectly, exceeds 300 per year.[43]

Measures in Relation to Turkey's Membership in International Conventions

Turkey is party to the Convention on the Physical Protection of Nuclear Material (CPPNM) and fully implements its provisions. The Foreign Affairs Committee of the Turkish Grand National Assembly (TGNA) has approved the proposal for the ratification of its 2005 amendment. Even before the amendment's ratification, the regulation on the physical protection of nuclear facilities and nuclear materials had been revised, taking into account the recommendations contained in INFCIRC/225/Rev.5 and the provisions contained in the "Implementing Guide on the Development, Use and Maintenance of the Design Basis Threat." Broadening the scope of physical protection measures in Turkey, the new regulation was published in the *Official Gazette* and entered into force on May 22, 2012. It contains measures governing the physical protection of nuclear facilities and materials from sabotage and theft during handling, use, storage, or transport.[44]

In the aftermath of the Seoul Summit, Turkey took part in technical meetings organized by the Agency in July 2012, October 2013, and February 2014 to develop the "Draft Implementation Guide on Physical Protection of Nuclear Materials During Transport," "Implementing the Legislative and Regulatory Framework for Nuclear Security," and "Draft Implementing Guide on Physical Protection of Nuclear Facilities. Turkey is among the initial signatories of the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). Before the Seoul Summit, its ratification was already approved by the TGNA and endorsed by the president. Having deposited the instrument of ratification on September 24, 2012, Turkey was now party to the convention. An amendment has been proposed by TAEK to update the relevant provisions of the Turkish Penal Code in accordance with Turkey's international undertakings in light of global developments. Interagency consultations on the draft are underway.[45]

Turkey fully supports the implementation of UNSC Resolution 1540 and continues to actively promote its objectives while supporting the work of the Committee. Government experts from Turkey have actively participated in a number of regional and international outreach and training events on the topics of implementing Resolution 1540, experience sharing, capacity building, counterterrorism, export controls, and border security.

In June 2010, Turkey received an IAEA advisory mission on state systems for accountancy and control (ISSAS), during which the draft national regulation on accounting for and control of nuclear materials was discussed and IAEA's recommendations were reflected in the reviewed text. The ISSAS report was not published, and the authorities have not provided information on how the regulations were changed to reflect the report. Yet, the regulation was published in the *Official Gazette* and entered into force on May 30, 2012. Turkey notified the IAEA of its support for the IAEA Code of Conduct on the Safety and Security of Radioactive Sources. Turkish authorities remind that "Turkey's legislation and practices are fully in line with the Supplementary Guidance on the Import and Export of Radioactive Sources".[46] Turkey has designated a point of contact for the Guidance and responded to the Self-Assessment Questionnaire. Turkey also supports the establishment of the IAEA Nuclear Security Guidance Committee and has informed the IAEA of its intention to participate in the work of the Committee.

During a visit to Turkey in November 2012, senior IAEA experts met with representatives from government agencies and the private sector to exchange information on Turkey's nuclear power program and IAEA's advisory services. An IAEA national workshop on the physical protection of nuclear material and facilities geared toward newcomers to nuclear power was organized in Ankara on October 7-11, 2013, where government representatives were tasked with developing and enforcing nuclear security measures.

On Turkey's invitation, an Integrated Nuclear Infrastructure Review (INIR) mission was hosted in Ankara in November 2013. The two-week mission reviewed Turkey's progress in developing a national infrastructure for the country's nuclear power program. The final report of the mission concluded that Turkey had made important progress in its development of nuclear infrastructure and that strong government support for the project was evident along with effective mechanisms for coordination among individual institutions. While making no specific or major recommendations concerning physical protection measures taken by Turkey, the report identified several of them as good practices. Even though this is more about safeguards than security, and the difference is important, Turkish authorities placed special emphasis on this issue to show that Turkey was both in full compliance with the NPT and its safeguards agreement and also prepared to deal with non-state threats.[47]

For Turkey and 59 other countries, the Technical Secretariat of the IAEA "found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these 60 countries, all nuclear material remained in peaceful activities."[48] Turkey is categorized by the IAEA in the rank of "Broader Conclusion" countries, which is acknowledged as the highest level in terms of nuclear material accounting and control.[49]

Voluntary Contributions to International Initiatives against Nuclear Smuggling

Turkey regards multilateral counter-proliferation initiatives as important voluntary cooperative mechanisms that complement existing international instruments and export control regimes. As a partner in the Global Initiative to Combat Nuclear Terrorism (GICNT) and participant in the Proliferation Security Initiative (PSI), Turkey contributes to the work of such initiatives as well as the G-8 Global Partnership against the Spread of Weapons and Materials of Mass Destruction (WMD), and other bilateral, regional, multilateral, and non-governmental activities. Turkey continues to discourage the use of HEU and plutonium and encourages the development of low enriched uranium alternatives. In compliance with these practices, Turkey has been exchanging the HEU fuel used in the 5 MW research reactor at the Çekmece Nuclear Research and Training Center for low enriched uranium with the United States since 1980. Depleted fuel elements were shipped back to the U.S. on December 14, 2009, in accordance with IAEA standards and national legislation. IAEA supervised the exchange.[50]

Turkey's Multilateral Initiatives to Prevent Smuggling in the Black Sea Basin

The increasing number of nuclear smuggling activities near the Black Sea during the 1990s attracted the attention of countries like the United States, which was threatened by the possibility of weapons of mass destruction passing into the hands of non-state actors, namely terrorists. Therefore, the United States intensified its efforts to maintain an active presence in the Black Sea as is the case in the Mediterranean under the banner of "Active Endeavor," which aims to aid Mediterranean countries in their fight against WMD proliferation and terrorism. Russia and Turkey did not welcome these efforts, however, both of which were (and still are) highly sensitive about the provisions in the 1936 Montreux Convention.[51] The United States coming to the Black Sea with all its military might necessitates the permanent basing of its navy and other military provisions, which could endanger the implementation of the convention.

Hence, as a precautionary measure, Turkey has taken the lead in creating regional military capabilities against the dangers associated with trafficking activities and terrorist incidents involving the Black Sea littoral countries. The BLACKSEAFOR[52] and the Black Sea Harmony[53] seek to increase capabilities as well as a certain degree of preparedness in order to deal with all the security and safety problems that arise in and around the region.

CONCLUSION

Turkish authorities admit that smuggling chemical, biological, radiological, and nuclear materials (CBRN) through Turkey can have negative consequences on not only security but also the social and environmental health of any country. Due to its geographic location, Turkey is vulnerable to such threats. Under these circumstances, any information or intelligence regarding the smuggling of these materials is meticulously evaluated and acted upon in cooperation with other stakeholder institutions.[54] Hence, officials emphasize that the set of measures taken against nuclear smuggling activities constitute the "first line of defense" against other attempts focused on damaging Turkey's interests and population by staging attacks with crude weapons containing radiological material.[55] For a successful campaign to prevent illicit trafficking of nuclear material within Turkish borders, inter-agency cooperation and collaboration must be both substantial and effective. To achieve this goal, the specific responsibilities and jurisdiction areas of the state apparatus must be delineated properly. Even though statements made by high-ranking officials and politicians give an impression that Turkish authorities have given this issue the highest priority, there is still a long way to go.[56] For instance, the quarterbacking role of TAEK in these efforts must be consolidated by revising and updating national legislation accordingly.

It goes without saying that intelligence is a key ingredient in the fight against smuggling networks. Since 2010, the Undersecretariat of the National Intelligence (MİT) in Turkey has been undergoing a thorough transformation under the tenure of Dr. Hakan Fidan, who holds a doctoral degree in International Relations with his dissertation topic titled "Diplomacy in the Information Age: The Use of Information Technologies in Verification."[57] Hence, it wouldn't be unfair to argue that Turkey's performance should be better when dealing with nuclear trafficking, seeing as how the intelligence community is governed by someone whose academic background allows him to grasp the seriousness of the situation at hand.

1_ Two terrorist organizations, among others, namely ASALA and the PKK, have been responsible for most of the terrorist attacks on Turkish civilians, security forces, and diplomats. The Armenian Secret Army for the Liberation of Armenia (ASALA) assassinated more than 30 Turkish diplomats and citizens all over the world throughout the 1970s and early 1980s. The Kurdistan Workers Party (*Partiya Karkeren Kurdistan* - PKK) waged a separatist movement in Turkey's southeast and is responsible for the death of more than 40,000 people since 1984. The list is not exhaustive but this matter deserves much longer and deeper discussion in a separate academic paper.

2_ http://www.egm.gov.tr/EN/Dkmanlar/2010_Ingilizce.pdf.

3_ It may be more appropriate to use the terminology of the age (i.e. the 1960s) where stability in superpower rivalry was believed to owe much to the existence of a "delicate balance of terror," so labeled after the work of Albert Wohlstetter, a leading strategist at the RAND Corporation. See Albert Wohlstetter, "The Delicate Balance of Terror," in Philip Bobbitt, Lawrence Freedman and Gregory F. Treverton (eds.), *US Nuclear Strategy: A Reader*, London: The Macmillan Press, 1989, pp. 143-167.

4_ The cult's name means "the ultimate truth." In that attack, a dozen people were killed and thousands were injured.

5_ In the late 1990s, some cult members were arrested during an attempt to buy uranium mines in Australia via the establishment of parent companies in order to conceal their activities. Some other members of the cult were also arrested in their attempt to acquire a seed stock of the deadly Ebola virus under the guise of scholarly cooperation during an academic gathering in the middle of an outbreak in Africa. The author recalls his conversations with authorities in the field on the sidelines of international conferences and workshops that he attended around the world since the late 1990s.

6_ For a discussion on Al Qaeda's efforts to acquire nuclear weapons capability, see David Albright, "Al Qaeda's Nuclear Program: Through the Window of Seized Documents," *Special Forum No.* 47, 2002. http://oldsite.nautilus.org/archives/fora/Special-Policy-Forum/47_Albright.html.

7_ Oleg Bukharin and William Potter, "Potatoes were guarded better," *The Bulletin of the Atomic Scientists* (May-June 1995), Vol. 51, No. 3), pp. 46-50.

8_ For a detailed account of the efforts of the United States to deal with the problems that emerged in the former Soviet territories in regards to the safety and security of WMD stockpiles and related facilities, see James E. Goodby *et al.*, *Cooperative Threat Reduction for a New Era,* Washington, D.C.: Center for Technology and National Security Policy, National Defense University, September 2004. http://www.nti.org/media/pdfs/CooperativeThreatReductionForANewEra.pdf?_=1323825759; George Perkovich *et al.*, *Universal Compliance: A Strategy for Nuclear Security*, Washington, D.C.: Carnegie Endowment for International Peace, March 2005. http://carnegieendowment.org/2007/06/20/universal-compliance-strategy-for-nuclear-securitywith-2007-report-card-on-progress org/.les/UC2.FINAL3.pdf ; Robert J. Einhorn and Michele A. Flournoy, eds., *Protecting against the Spread of Nuclear, Biological, and Chemical Weapons: An Action Agenda for the Global Partnership*, 4 volumes, Washington, D.C.: Center for Strategic and International Studies, January 2003. http://csis.org/publication/protecting-against-spread-nuclear-biological-and-chemical-weapons. Matthew Bunn and Anthony Wier, *Securing the Bomb 2004: An Agenda For Action,* Cambridge, Mass., and Washington, D.C.: Project on Managing the Atom, Harvard University. http://www.nti.org/media/pdfs/Securing_The_

Bomb_2004.pdf?_=1317161710. Also see and the website of Nuclear Threat Initiative, http://www.nti.org/cnwm.

9_ For an account of these and other significant cases of illegal trafficking of nuclear material in the 1990s, see William Potter and Elena Sokova, "Illicit Nuclear Trafficking in the NIS: What's New? And What's True?" *Nonproliferation Review* (Summer 2002), Vol. 9. No. 2, pp. 112-120.

10_ Lyudmila Zaitseva, "Illicit Trafficking in the Southern Tier and Turkey since 1999: A Shift from Europe?" *The Nonproliferation Review* (Fall/Winter 2002), Vol. 9, No. 3, pp. 168.

11_ Ibid.,

12_ Mahmut Cengiz, "Smuggling of Nuclear Materials in the Former Soviet Union," *Turkish Journal of Police Studies*, Vol. 13, No. 1, pp. 25-50. Dr. Cengiz is a Turkish police officer who pursued doctoral studies at George Mason University in the United States.

13_ Ibid.,

14_ "Atom Bombası Operasyonu (Atomic Bomb Operation)," *Milliyet*, 6 October 1993, p. 1.

15_ Prof. Pınar Bakır, who was also a businessman, admitted during interrogations that 2.5 kilograms of uranium-238 confiscated was smuggled from Hartenholm to Turkey aboard a Cessna aircraft. See "Take-Off Permit for Nuclear Smugglers," *Focus*, 15 May 1995, p. 12.

16_ The source comes from a telephone conversation with high-ranking authorities from TAEK who were kind enough to review the first draft of this paper and wished not to be identified. 12 September 2014. Istanbul.

17_ KOM, which stands for "Kaçakçılık ve Organize Suçlarla Mücadele," is the Turkish acronym for the Anti-Smuggling and Organized Crime Department of the Turkish Police.

18_ İlhan Tıncı, "Iranian Embassy Official Denies Link In Uranium Trade," *Türkiye*, 7 October 1993, p. 7.

19_ "'Key Man' in Smuggling Operation Identified," *Proliferation Issues*, 17 November 1993, original source: *Milliyet* (Istanbul), 7 October 1993, p. 16.

20_ Telephone conversation with TAEK officials. 12 September 2014. Istanbul

21_ "Seven Detained in Turkey With Uranium Haul," *Reuters*, 22 July 1994. See *Reported Nuclear Trafficking Incidents Involving Turkey* Selected Abstracts: 1993-1999*. http://cns.miis.edu/wmdme/flow/turkey/abslist.htm. Also see http://www.nti.org/analysis/articles/seven-detained-turkey-uranium-haul/

22_ Telephone conversation with TAEK officials. 12 September 2014. Istanbul. No information, however, was given about what kind of natural uranium it was, and whether it was yellowcake, metal, or UF6.23_ "509 gram işlenmemiş uranyum ele geçirildi," *Sabah*, 5 March 1997. http://arsiv.sabah.com.tr/1997/03/05/f18.html.

24_ See "Turkish Police Arrest Uranium Smugglers," BBC World News, 7 September 1998, http://news.bbc.co.uk. Also see http://www.themoscowtimes.com/news/article/turks-hold-8-for-smuggling-nuclear-matter-out-of-russia/285403.html

25_ Ibid.,

26_ Telephone conversation with TAEK officials. 12 September 2014. Istanbul

27_ Douglas Frantz, "Nuclear Booty: More Smugglers Use Asia Route," *The New York Times* September 11, 2001. http://www.personal.umich.edu/~sanders/214/other/news/091101NuclearBooty.html.

28_ Ibid.,

29_ International Atomic Energy Agency (IAEA), *IAEA Illicit Trafficking Database (ITD)*, Quarterly Reports, 2003–2005.

30_ United Nations Special Commission (UNSCOM) was created by the UN Security Council Resolution 687 dated April 3, 1991 in order to "destroy, remove or render harmless" the weapons of mass destruction and ballistic missile capability of Iraq.

31_ Telephone conversation with TAEK officials. 12 September 2014. Istanbul

32_ The Circular (No: B.02.1.GÜM.0.06.00.19.570.16) issued by the Undersecretariat of the Customs on July 6, 2005, for the implantation of the decision that was taken at the coordination meeting held in Ankara on June 28, 2005.

33_ "Nükleer madde kaçakçılığı ile mücadele (Fight against nuclear smuggling)", *Milliyet*, January 20, 2009. http://www.milliyet.com.tr/nukleer-madde-kacakciligi-ile-mucadele/ekonomi/ekonomidetay/20.01.2009/1049542/default.htm

34_ Telephone conversation with high-ranking authorities from TAEK. 12 September 2014. Istanbul

35_ The FBI broadly defines organized crime as "any group having some manner of a formalized structure and whose primary objective is to obtain money through illegal activities". See Federal Bureau of Investigation, "FBI Glossary," FBI.gov cited in Zaitseva "Organized Crime, Terrorism and Nuclear Trafficking," *Strategic Insights* (August 2007), Vol. VI, No. 5. p. 5. The definition adopted by the INTERPOL General Assembly of the member countries in 1998 states that 'any enterprise or group of persons engaged in a continuing illegal activity which has as its primary purpose the generation of profits irrespective of national boundaries' constitutes organized crime. See "The Problem of Definitions," published in Monograph No. 28: Organized Crime in South Africa, August 1998 cited in Zaitseva, "Organized Crime, Terrorism and Nuclear Trafficking", p. 5.

36_ According to data on countries and nationals suspected of working with organized crime in nuclear trafficking incidents from 2001 to 2005, Ukraine ranks first with 9 cases, followed by Russia with 7 cases and Georgia with 5 cases of nuclear smuggling attempts. See Lyudmila Zaitseva, "Organized Crime, Terrorism and Nuclear Trafficking," *Strategic Insights* (August 2007), Vol. VI, No. 5.

37_ *Turkish Report of Anti-Smuggling and Organized Crime 2012*, Ministry of the Interior, Department of Anti-Smuggling and Organized Crime, April 2013, Periodical Publication, Ankara, p. 56.

38_ http://www.kom.gov.tr/Tr/Dosyalar/Anti-Smuggling%20and%20Organized%20Crime%20Report%20of%20Turkey%202009.pdf

39_ *Turkish Report of Anti-Smuggling and Organized Crime – 2011 Report: Operational Activities, Training and International Cooperation Activities*, Ministry of Interior, Turkish National Police, Department of Anti-Smuggling and Organized Crime, Ankara, March 2012, p. 47.

40_ *National Progress Report of Turkey to the Nuclear Security Summit on the Implementation of the Washington Work Plan*, Seoul, 26-27 March 2012.

41_ http://www.coedat.nato.int. The author of this paper served as the Academic Advisor of COE-DAT from January 2006 to January 2013 and has been the first-hand witness of the level of close cooperation between the COE-DAT and TAEK.

42_ *National Report: Safety and Security of Radioactive Sources in Turkey*, Turkish Atomic Energy Authority, June 2014, p. 11.

43_ Telephone conversation with high-ranking authorities from TAEK. 12 September 2014. Istanbul

44_ *Nuclear Security Summit, National Progress Report, Turkey*, The Hague, March 2014. https://www.nss2014.com/sites/default/files/documents/turkey.pdf.

45_ Ibid.,

46_ Telephone conversation with high-ranking authorities from TAEK 12 September 2014. Istanbul.

47_ Telephone conversation with high-ranking authorities from TAEK 12 September 2014. Istanbul.

48_ *Safeguards Statement for 2012*, p. 1. http://www.iaea.org/safeguards/documents/es2012.pdf.

49_ http://www.taek.gov.tr/basin-aciklamalari/313-2013/1102-basin-aciklamasi-no-01-2013-turkiye-uluslararasi-atom-enerjisi-ajansi-nin-uaea-nukleer-guvence-denetimleri-sonucunda-edinilen-ve-en-ust-seviyeye-karsilik-gelen-broader-conclusion-sinifindaki-ulkeler-arasina-girdi.html.

50_ *Nuclear Security Summit, National Progress Report, Turkey*, The Hague, March 2014. https://www.nss2014.com/sites/default/files/documents/turkey.pdf.

51_ The implementation of the Montreux Convention in 1936 led to the abolishment of the International Straits Commission, which was established as per the provisions of the Lausanne Treaty that led to the creation the modern Republic of Turkey following the War of Liberation against the occupying powers in the aftermath of World War I. Turkish sovereignty and military control over the Straits and the refortification of the Dardanelles was fully reinstated. Turkey was authorized to close the Straits to all foreign warships in wartime or when threatened by aggression. Turkey was also authorized to refuse transit from merchant ships that belonged to countries at war with Turkey. In addition, a number of highly specific restrictions were imposed on the types of warships allowed passage. This was a major diplomatic success for Turkey, which was a result of Atatürk's carefully and patiently crafted diplomacy and taking the right steps at the right time. See Şule Güneş, "Türk Boğazları" (Turkish Straits), *ODTÜ Geliştirme Dergisi*, December 2007, No. 34, pp. 217-250.

52_ BLACKSEAFOR stands for "The Black Sea Naval Co-Operation Task Group", which has been initiated by Turkey at the second Chiefs of the Black Sea Navies (CBSN) meeting that was held in Varna/Bulgaria in 1998. Bulgaria, Georgia, Romania, Russian Federation, Turkey, and Ukraine signed the BLACKSEAFOR establishment agreement on April 2, 2001, in Istanbul. http://www.mfa.gov.tr/blackseafor.en.mfa

53_ Operation Black Sea Harmony (OBSH), inspired by NATO's standing naval operations, aims to provide maritime security in the Black Sea through presence operations involving shadowing, trailing, and interdiction. The Turkish Navy launched OBSH on March 1, 2004. It has become affiliated with the NATO-led Operation Active Endeavour in the Mediterranean regarding information and intelligence sharing as well as suspect vessel shadowing and interdiction. OBSH consists of regular patrols with frigates and patrol boats in pre-defined surveillance areas in the Black Sea. Helicopters, submarines, maritime patrol aircraft, and coast guard vessels assist in this endeavor. http://turkishnavy.net/2009/04/01/more-on-operation-black-sea-harmony/

54_ *Turkish Report of Anti-Smuggling and Organized Crime – 2012 Report*, Ministry of Interior, Turkish National Police, Department of Anti-Smuggling and Organized Crime, Ankara, April 2013, p. 56.

55_ Conversations with Turkish officials from the civil and military bureaucracy. August/September 2014, Ankara and Istanbul.

56_ See, for example, the *Statement by H.E. Abdullah Gül, President of the Republic of Turkey at the Third Nuclear Security Summit*, The Hague, Netherlands, 24-25 March 2014. http://www.tccb.gov.tr/dosyalar/2014-03-23-NATOKonusma-Eng.pdf

57_ The Undersecretary of MİT, Dr. Hakan Fidan, conducted his doctoral research in the Department of International Relations at Bilkent University in Ankara under the supervision of the author of this paper. Dr. Fidan's doctoral dissertation, titled "Diplomacy in the Information Age: The Use of Information Technologies in Verification" (2006), is available in the library of Bilkent University. http://www.thesis.bilkent.edu.tr/0003191.pdf.

Nuclear Security from a Turkish Perspective: An Assessment

Aaron Stein

Research fellow, The Royal United Services Institute

Non-Proliferation Program Manager, EDAM

INTRODUCTION: NUCLEAR ENERGY AND NUCLEAR SECURITY

For more than six decades, Turkish officials have advocated for the development of nuclear energy to help decrease the country's reliance on imported fossil fuels. In 2010, Turkey concluded an agreement with Russia's Rosatom for the construction of four VVER-1200 reactors at the Akkuyu site, near the coastal city of Mersin. Just three years later, in May 2013, Turkey signed an agreement with a Mitsubishi led consortium to build a second nuclear power plant near the city of Sinop. Ankara hopes to have at least one reactor up and running at the Akkuyu site by 2023 – the 100-year anniversary of the founding of the Turkish Republic.

Turkey faces a number of unique security threats that it will have to contend with as it continues to develop nuclear power. This study, which details many of these challenges, is the first of its kind for Turkish nuclear industry. As this study notes, Turkey is a known transit route for nuclear smuggling, has experienced decades of terror attacks, and currently borders two conflict zones in Iraq and Syria. These challenges are not limited to Turkey, but nevertheless, as a new nuclear state, Ankara has an incentive to identify potential threats and adopt comprehensive policies to protect the country's future nuclear power plants and related infrastructure.

Ankara is currently in the process of formulating more comprehensive regulations to ensure the safe construction of nuclear power plants and to protect the facility from attack. As a new nuclear state, Turkey has a unique opportunity to simultaneously follow the internationally recognized best practices, while also learning from the mistakes of other more mature nuclear states. Matthew Bunn and Scott Sagan refer to the opportunity for new nuclear states to learn from so-called "worst practices," where common organizational problems resulted in lax security at nuclear power plants.[1]

If Ankara takes advantage of this opportunity, it has the opportunity to create a comprehensive approach to nuclear site security that accounts for the threats posed by outside attacks, so-called insiders, and the cyber threat. In doing so, Turkey can set an example for other new nuclear states.

Nuclear Power in an Unstable Region

As the previous chapters have shown, policymakers are committed to putting in place the proper legislation to ensure that the Akkuyu and Sinop facilities are well protected from potential attack. These efforts, however, have been uneven, and Turkish policymakers have thus far failed to adopt all of the necessary regulations and policies to safeguard its future nuclear infrastructure. To over come this gap, Can Kasapoglu and Doruk Ergun described of the risks to Turkey's future nuclear infrastructure. The major risk associated with the development of nuclear power is the unintentional release of radiological material, or the theft of radiological materials. Chapter 1 focused on the threat posed by the intentional release of such

materials, either through the intentional targeting of the reactor site, an insider attack, or via an outsider attack on the reactor itself.

With regards to the latter, Turkish officials should incorporate certain safety and security features designed to withstand a well-planned assault on the facility. Turkey has made clear that it intends to abide by all IAEA practices regarding nuclear security. As such, Turkey has verbally committed to abide by agreed upon international norms governing the protection of the reactor site from both the outsider and insider threat. As Kasapoglu and Ergun note, the United States Nuclear Regulatory Commission (NRC), defines the "outsider threat" as "Well-trained (including military and skills) and dedicated individuals, willing to kill or be killed, with sufficient knowledge to identify specific equipment or locations necessary for a successful attack." The NRC makes clear that outsiders could rely in insiders to aid with their attack. Thus, at a minimum, Ankara has already pledged to take appropriate steps to defend against a well-planned attack on its future plants.

These norms, however, were not formulated specifically for Turkey and the current threats the country faces. Turkey, while not unique in this regard, will have to account for the possibility that a group of attackers, trained to use small arms, could conceivably plot to attack the facility to inflict environmental and economic harm to the Turkish state. Ankara has been fighting a low-level insurgency with the Kurdistan Workers' Party (PKK) since the early 1980s. The group, as Kasapoglu and Ergun indicate, has "sabotaged and raided pipelines and energy infrastructure using a variety of weapons including bombs, explosives, IEDs and rocket propelled grenades." Yet, despite this security risk, Ahmet Han, Mitat Celikpala, and Ergun note in Chapter 2 note that even after a 2008 attack on the BTC pipeline near Refahiye (which has officially been attributed to the PKK, but could in fact have been caused by a cyber attack) resulted in millions of dollars in economic and environmental damage, Turkey has "not yet adopted a fully integrated CEI safety and security framework…"

In addition, the radical leftist group, the DHKP-C, has carried out terrorist attacks inside Turkey for decades. The DHKP-C has recently claimed credit for a suicide bombing at the American embassy in Ankara, attacked the Presidential Palace in Ankara with rocket propelled grenades, and has tried to attack numerous other government buildings.[2] Moreover, in January 2015, a Russian national, Diana Ramazova, detonated a suicide bomb at a police station in Sultanahmet – Istanbul's most popular tourist area. Ramazova, according to numerous reports, twice travelled to Syria between June 2014 and January 2015 with an unidentified male with reported links to the terror group, the Islamic State.[3] To date, some 600 Turkish citizens have gone to Syria to fight primarily with the Al-Qaeda affiliate Jabhat al Nusra (JaN) and the Islamic State.[4] The conflict in Syria, which has since spilled over into Iraq, pose a new set of potential threats that Turkish policymakers must account for when crafting nuclear security regulations. The dynamics of the conflict portend continued instability in both Syria and Iraq for the foreseeable future.

With regards to the latter, Ankara has been deeply involved in the conflict since severing ties with the Assad regime in September 2011. Turkey subsequently opted to arm numerous rebel groups and implemented a lax border policy that allowed for scores of foreign fighters to transit Turkish territory. Many of these foreign fighters have subsequently joined the Islamic State, or JaN. After largely turning a blind eye to the rise of extremist groups in Syria, Ankara began to crack down on the flow of foreign fighters going in early 2014.[5] However, as recently as January 2015, Hayat Boumeddiene, an alleged accomplice in the terror attack against

the satirical French magazine Charlie Hebdo and a Kosher market, travelled to Turkey and then on to Syria; underscoring how difficult it is to secure the border. Turkish Foreign Minister, Mevlut Cavusoglu, has warned about the growing risk of foreign fighters, saying that Turkey and the European Union share a common concern about these fighters and is concerned about their return from the Syrian battlefields.[6]

These risks, in turn, must be accounted for, as Ankara continues to codify a comprehensive approach to nuclear security. While no country is immune from terrorist violence, Ankara has a bevvy of groups operating within its borders, in addition to the unique threats posed by conflict in Syria and Iraq. To this end, Turkish policymakers should seek to go beyond the established IAEA and international norms outlined to defend against a potential attack against nuclear facilities. With this in mind, Turkish policymakers must account for the way in which these different radical groups have carried out attacks against government targets in the past and incorporate this threat assessment in to a new comprehensive law governing the security of critical infrastructure. This approach, as detailed in Chapters 1 and 2, would result in a more comprehensive approach to site security at CEI facilities.

Thus, as a first step, Ankara should define CEI; thereafter, it should put together a comprehensive piece of legislation that articulates an overarching approach to site security. To do so, Turkey should consult with a range of actors, including all of the relevant international institutions, local think tanks/civil soviet groups, and Turkish businesses. It should then integrate the lessons learned and input from these groups with its own assessments about the terror threat. This information should then be used to formulate a set of standards that every CEI facility would have to adhere to. In turn, the government would then appoint an independent authority to oversee inspections. In this regard, Ankara must ensure that the safety regulator is independent and beholden to Parliamentary oversight, rather than simply being included in a ministry that reports directly to the Prime Ministry.

Accounting for the Insider Threat

Turkey should also be mindful that such an attack could be aided by sympathetic accomplice working in the nuclear plant. According to Sagan and Bunn, "Insider threats are perhaps the most serious challenges that nuclear security systems face. All of the cases of theft of nuclear materials where the circumstances of the theft are known were perpetrated either by insiders or with the help of insiders."[7] To account for the insider threat, Kasapoglu and Ergun note, the Turkish authorities will "vet and perform background checks on all 12 thousand (4 thousand Russian and 8 thousand Turkish) employees, including interns, contractors, of the Akkuyu NPP." The careful screening of the employees is designed to minimize the threat of a group conspiring working within the plant could conspire – and gain access to – the reactor's pressure vessel, other sensitive areas within the reactor complex, or the reactor's computer network. However, as Kasapoglu and Ergun indicate, background checks are not all that effective, especially if attackers use coercion to overcome the site's security systems. As such, Turkish policymakers must ensure that its regulations take into account the need to protect potential "whistleblowers" that may come forward with information about potential security threats inside the plant.

The first line of defense against such an attack rests with Turkey's security and intelligence services. However, there is no guarantee that these background checks

will eliminate the potential insider threat. The potential accomplice could, up until his/her decision to aid in an attack, be a law-abiding citizen. Turkish security planners should therefore seek to improve upon the current approach to critical infrastructure security, which, as Han, Celikpala, and Ergun, note is still based on "case specific international agreements designed for a particular projects."

Turkey must also account for the threat posed by a "cyber insider" – an individual that knowingly, or unknowingly, aids in a cyber attack. In the case of the Stuxnet cyber attack on Iran's Natanz enrichment facility, the available evidence suggests that the malware was installed on Iran's computer via a memory stick brought in from the outside of the facility.[8] In a 2012 attack on Saudi Aramco's, cyber security experts concluded that the event "involved a company insider, or insiders, with privileged access to Aramco's network."[9] More recently, in 2015, a cyber attack on a German steel mill resulted physical damage to equipment, after the mill's operators were prevented from shutting down a blast furnace.[10] The attack is only the second confirmed case that resulted in actual physical damage – the other being the aforementioned Stuxnet.

Turkey may also have been subjected to a cyber attack that resulted in physical damage. In 2008 western intelligence agencies believe that Russian hackers "shut down alarms, cut off communications and super-pressurized the crude oil" being pumped through the Baku-Tbilisi-Ceyhan pipeline, near the Turkish city of Refahiye.[11] The explosion "caused more than 30,000 barrels of oil to spill in an area above a water aquifer and cost BP and its partners $5 million a day in transit tariffs during the closure."[12] Ankara has officially attributed the attack to "mechanical failure." The PKK has also claimed credit for destroying the pipeline. However, according to a subsequent investigation, hackers appear to have accessed to the pipeline's internal network by exploiting a weakness in the windows software used to operate the pipeline's security cameras. To date, the event has yet to be adequately explained by either the Turkish authorities, or British Petroleum – the energy conglomerate responsible for the pipeline.

The attack highlights the complexity of the cyber challenges. Turkey's state-run BOTAS, which oversees the operation and security of the Baku-Tbilisi-Ceyhan pipeline in Turkey, relies on a slew of sensors, cameras, and manned patrols to ensure pipeline security. Nevertheless, reports indicate that the control center did not learn about the attack for more than 40 minutes, despite the camera system, and regular manned patrols. This attack underscores the need for Turkey to formulate a comprehensive approach to cyber security. Absent a comprehensive set of regulations, cyber security will continue to be based on a per-project basis. As such, standards could differ – and thereby allow for hackers to exploit potential weak points in Turkish infrastructure. In the case of a similar attack on a nuclear plant, such slow response time could be far more catastrophic than in the case of the Refahiye incident.

To date, Ankara has yet to fully develop a comprehensive approach to cyber security. Ankara first tasked the Scientific and Technological Research Council of Turkey (TUBITAK) to devise a comprehensive cyber security plan, before turning the task over to the Prime Ministry's Disaster and Emergency Management Presidency (AFAD).[13] In 2012, the Council of Ministers tasked the Minister of Transport, Maritime Affairs and Communications with overseeing the newly created Cyber Security Council and to prepare national cyber security policies.

Turkey's initial step to appoint a specific government ministry to oversee the formulation of state policy is a step in the right direction. However, Ankara has yet to adopt a fully integrated approach to the issue, choosing instead to pursue

infrastructure security on an individual project basis. As a first step towards integrating nuclear security with that of cyber security, the Cyber Security Council should clearly define Turkey's critical infrastructure and explain how the it intends to integrate the protection of these facilities into a better defined cyber security policy. Turkey should also consider centralizing the cyber security issue and creating governmental mechanisms and creating countrywide cyber security standards.

In Finland, for example, the government is responsible for "providing political guidance and strategic guidelines" for the government as a whole. Implementation is left to each individual ministry, which will soon report to a Security Committee, tasked with overseeing the implementation of the country's comprehensive cyber security strategy. This Security Committee is part of the Ministry of Defense and thereby subjected to Parliamentary oversight.[14] As part of this national policy, Finish companies are "required to include cyber preparedness in their normal continuity management planning." Ankara could adopt elements of the Finish model, or devise a new system based solely on the Turkish experience.[15]

However, like in the case of physical protection of CEI, the major weakness is that Ankara has yet to formulate a clear, comprehensive, and consistent approach to the cyber security threat.

As such, its approach remains on a project-by-project basis. This approach makes Turkey vulnerable to cyber attacks. A potential attacker, for example, could take advantage of a weak link in the nuclear plant's network – like during the alleged Refahiye pipeline attack – to gain access to more critical systems to either aid in an external attack on the plant, or to cause physical damage. To account for this vulnerability, Ankara should include cyber security in its overarching threat assessment, and include a standard set of regulations in the aforementioned set of universal standards for CEI facilities to follow.

Nuclear Smuggling: Tweaking a Successful System

As Mustafa Kibaroglu wrote in chapter 3, Turkey is committed to preventing the smuggling of radioactive nuclear material through its territory. Ankara has decades of experience in working with regional states and its western allies to help prevent the smuggling of nuclear material through its territory. After the collapse of the Soviet Union, Turkey often times found itself on the front line of global efforts to interdict smugglers who had acquired fissile material from poorly guarded Soviet facilities. In recent years, the pace of nuclear smuggling has decreased, after a concerted international and Russian effort resulted in increased security at Soviet era nuclear facilities.

Nevertheless, the recent events in Syria have made clear how difficult it is to interdict individuals determined to cross Turkey's border with Syria. In the case of nuclear smuggling, the task of detection begins with adequate physical security at areas where nuclear material is stored. In the event that any nuclear material is stolen, the task of recovering it would be left to specialized security teams. The Turkish national police have received specialized equipment from TAEK and policymakers have drafted updated guidelines to account for nuclear material inside Turkey.

However, the provisions relating to nuclear smuggling are spread over two separate pieces of legislation in the Turkish Criminal Code and the Anti-Smuggling Law and Counter Terrorism Act. Furthermore, a third directive, the 2010-

1012 Action Plan Against Organized Crime includes provisions relating to the interdiction of chemical, biologic, radiologic, and nuclear materials (CBRN).[16] To streamline Turkey's anti-CBRN smuggling efforts, Turkish policymakers should consider passing a new overarching law focused solely on CBRN smuggling that reflects the on-going efforts to craft on-site security regulations at both Akkuyu and Sinop nuclear sites.

In general, Ankara's efforts to date are in line with international best practices and reflect international efforts to prevent the smuggling of CBRN. Turkey should continue to implement the measures it has already put in place, while also focusing on training more personnel to assist with the on-going efforts. To date, the Turkish National Police report that there have been no instances of CBRN smuggling since 2006. In contrast, between 1993 and 2006, radiological material was seized by security personnel thirteen times. To be sure, the decrease in instances is a result of a combination of factors, including the improvement of security at nuclear sites in countries comprising the former Soviet Union.

Nevertheless, Turkey should continue to improve upon its anti-smuggling capabilities. Ankara should continue to emphasize the training of specialized personnel. It is not enough to simply provide the police with specialized equipment. The personnel using the equipment must be continually trained so that the skills needed to use, or operate the equipment do not atrophy. Moreover, Turkey should consider holding a greater number of unannounced exercises to test the effectiveness of the methods and personnel already in place. The exercises should then be used to gather more data about potential weak points and then used to improve the system in place. These exercises, however, must not be formulaic, but rather be reflective of the security services most up-to-date intelligence and threat assessments.

CONCLUSION: THE NEED FOR AN INTEGRATED APPROACH TO CEI SECURITY

Turkey's main priority is clear: the formulation of a comprehensive set of guidelines to defend Turkey's current and future CEI. As this study has noted, the current project-by-project approach to site security leaves Turkey vulnerable to a range of threats. Turkey has an opportunity to put in place a comprehensive approach to nuclear site security that is specifically designed to address its unique security challenges. As a first step, Turkey should define the country's CEI. This list should then be used as the basis with which to create a legally binding set of regulations for CEI site security. These guidelines should include clear guidance on cyber security. To ensure that these rules are implemented, the agency overseeing the implementation of these new rules, must be independent and, preferably, subjected to parliamentary oversight. As part of this agency's responsibilities, the authorities could publish a comprehensive report on CEI site security every year, and declassify sections of it so that that public could read the report's major findings.

To further increase readiness, Turkey should consider holding unannounced drills at critical CEI facilities to test the readiness and response of the on-site security and related government agencies. These drills should not be formulaic, but rather constantly updated to reflect recent threat assessments and intelligence. Inside CEI facilities, Turkish policymakers must also account for the insider threat and create mechanisms that incentivize and protect employees that "blow the whistle" on employee behavior that raise "red flags." This policy should include proper employee training seminars and the dissemination of information about previous insider attacks to the nuclear site's security personnel. This approach could help to create a two-layered approach to help identify possible insiders.

As a new nuclear state, Turkey has an opportunity to draft a comprehensive and integrated set of regulations governing nuclear security. These regulations should be curtailed to account for the unique threats Turkey faces, rather than simply be verbatim copies of IAEA regulations. Moreover, once these regulations are drafted, security planners should revisit their assumptions frequently and make changes when necessary. Such an effort would, in turn, help ensure that security planners continue to think outside of the box and continue to refine their approach to nuclear security in general.

With more than four years before Ankara's first reactor is expected to come online, Turkey has ample time to craft and implement effective site security regulations. Turkey should take advantage of this situation, consult with the appropriate partners, and begin the process of drafting a comprehensive and integrated set of standards for its nascent nuclear industry.

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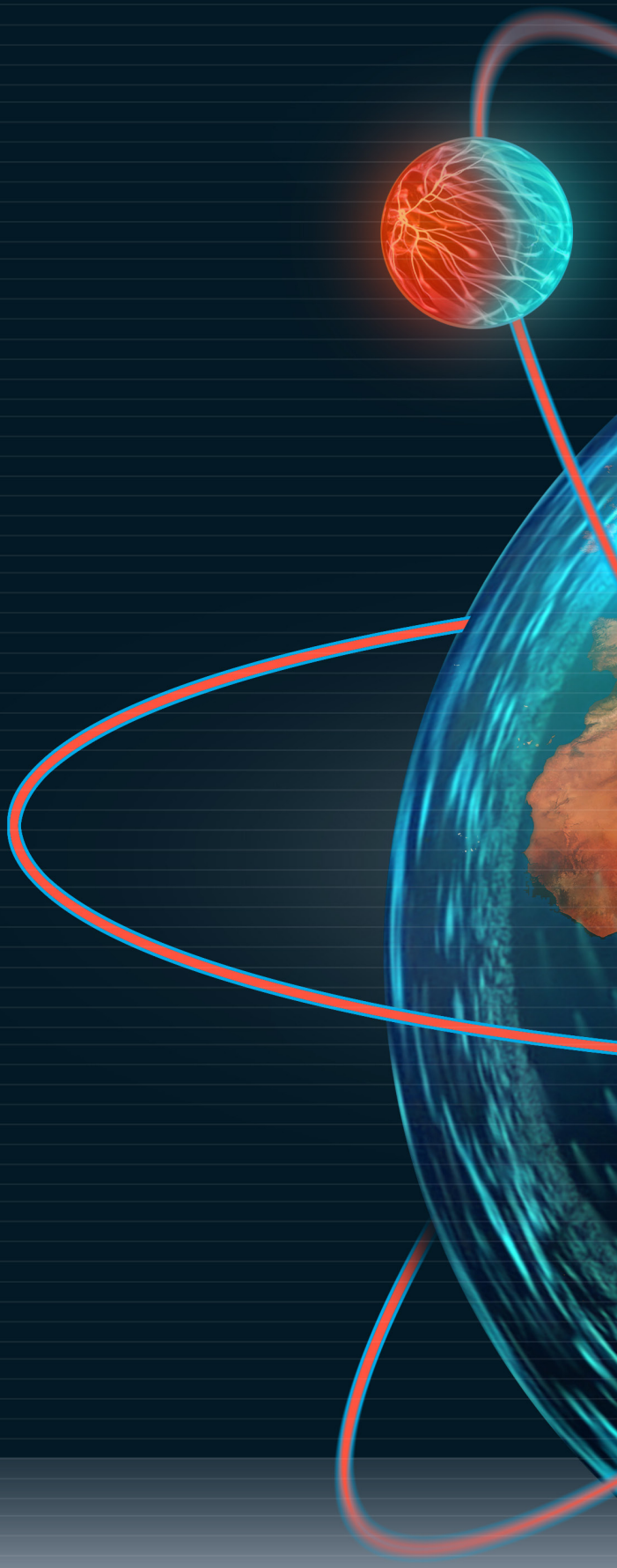

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Centre for Economics and Foreign Policy Studies

Hare Sokak K8 No:16,
Akatlar, 34335 Istanbul
Tel : 0212-352 1854
Email : info@edam.org.tr
www.edam.org.tr