U.S. DEPARTMENT OF ENERGY

PNNL-21197

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

# Global Threat Reduction Initiative

## Africa and Middle East Project Plan 2012

JD Jamison

February 2012

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Pacific Northwest National Laboratory
Richland, Washington 99352

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## EXECUTIVE SUMMARY

The goal of the Global Threat Reduction Initiative's (GTRI) Africa and Middle East Protect Program is to implement projects to protect vulnerable nuclear and radiological materials in the region. There are 68 countries in the region, 55 in Africa and 13 in the Middle East. The project teams face many challenges inherent to working in this region including: numerous high-activity sources coupled with concerns of high terrorist presence, lack of infrastructure, lack of control of radiological materials, political instability and violence prevalent in many of the countries. The African continent is home to many of the world's poorest countries. In contrast, the Middle East has many countries considered high-income countries, although several countries in the Middle East have conditions similar to those listed above. Thus, the entire region will continue to be a priority for GTRI's physical protection efforts for the foreseeable future.

GTRI is currently engaged in 24 of the 68 countries in the region and has provided security upgrades for radiological sources at 110 sites within these countries. PNNL's efforts include engagement in nine countries with 35 sites upgraded through December 2011. PNNL has developed various strategies that will allow GTRI to engage remaining high-priority countries and continue efforts in countries already engaged. The strategies are targeted to prioritize those countries that have a greater need for inclusion by virtue of the potential for housing high activity radioactive sources and the risk associated with those sources.

Efforts are underway to upgrade newly identified sites, and to develop sustainability strategies to ensure long-term security of the sources at completed sites. Because of the large number of countries requiring GTRI protect work, plans are underway to designate Centers of Excellence in three sub-regions of the African continent and one in the Middle East to encourage more developed GTRI partners to work with countries and share best practices on material protection, source security, and training. This is designed to leverage each country's experience with regulation development, control of sources, storage of disused sources, and radioactive source security upgrades.

GTRI and the International Atomic Energy Agency (IAEA) are both conducting security work in the region. PNNL coordinates closely with the IAEA when both organizations are working in the same country and, in some cases, at the same site. Frequent communications and routine meetings are arranged to discuss the ongoing efforts of both organizations and how the two organizations can collaborate to provide the best benefit for the countries in the region.

GTRI has introduced multiple cross-cutting projects into the region. Search and Secure training and equipment have been provided to multiple countries in the region and plans are underway to provide an additional three countries with this training during 2012. As work progresses in the region, GTRI will identify other potential candidates for this training in FY2013 and the out-years. Remote monitoring is another cross-cutting project that has been implemented in two of the PNNL managed countries. The IAEA has agreed to implement remote monitoring systems through the IAEA Cross-Cutting Project. PNNL has identified an additional three facilities that are candidates for IAEA installed remote monitoring systems in FY2012 and the IAEA is evaluating the possibility for installations made at these facilities.

# GLOBAL THREAT REDUCTION INITIATIVE
# AFRICA/MIDDLE EAST REGIONAL PROJECT PLAN

## 1.0 GLOBAL THREAT REDUCTION INITIATIVE OVERVIEW

### 1.1 Introduction

The bipartisan 9/11 Commission Report affirmed that Al-Qaeda has been trying to acquire nuclear and radiological materials for over ten years. Nuclear and radiological materials are found at thousands of civilian sites worldwide and are used for legitimate and beneficial commercial, medical, and research purposes. Unfortunately, materials at many civilian sites are often times poorly secured and controlled, making them attractive targets for theft or sabotage.

Radiological dispersion devices (RDDs) are unconventional weapons that terrorists might use to disperse radioactivity. These could be constructed with different radioactive materials in various forms. In an explosive RDD (conventional explosives are combined with radioactive sources), a radioactive plume spreads over an area and radioactive material will settle onto the ground and other surfaces. People remaining in the area could be exposed to direct radiation from material deposited on the ground and could inhale and ingest radiological material from a variety of pathways. RDDs could have catastrophic consequences, including loss of life, infrastructure damage and radioactive contamination, which could prohibit the use of a large geographical area, generate widespread panic and casualties, and create economic losses in the billions of dollars. Unlike nuclear "weapons of mass destruction," RDDs have been labeled as "weapons of mass disruption."

The mission of Global Threat Reduction Initiative (GTRI) is to reduce and protect vulnerable nuclear and radiological material located at civilian sites worldwide by:

- Converting reactors from the use of highly enriched uranium (HEU) to low enriched uranium (LEU);
- Removing or disposing of excess nuclear and radiological materials; and
- Protecting the remaining at-risk nuclear and radiological materials from theft and/or sabotage.

Furthermore, President Obama announced, during his presidential speech in Prague, Czech Republic on April 5, 2009, an international effort to secure all vulnerable nuclear material around the world within four years. GTRI's mission directly supports this presidential commitment.

### 1.2 Organization

The GTRI program is organized under the U.S. Department of Energy's National Nuclear Security Administration's (NNSA) Office of Global Threat Reduction. The GTRI program utilizes multiple National Laboratories and private contractors to implement various technical projects. The Pacific Northwest National Laboratory (PNNL) is one of the national laboratories supporting the GTRI program. PNNL's primary role is to provide project management and

technical support to the nuclear and radiological security efforts by preventing terrorists from acquiring nuclear and radiological materials that could be used in weapons of mass destruction or other acts of terrorism. In the Africa and Middle East Region multiple laboratories are utilized to implement these security programs. Appendix 1 is a map of the region that identifies the countries that are currently engaged in the program, which organization is managing those projects, and remaining countries that are not yet engaged in the program.

At PNNL the Africa and Middle East Protect Portfolio is organized under the International Material Protection Program (IMPP). There are currently 40 staff supporting the IMPP program. Jeremy Jamison is the Regional Project Manager who is responsible for overseeing PNNL's project implementation in the Africa and Middle East and maintaining the business relationships with the client, NNSA. Within the Africa and Middle East region there are four staff members that directly support the project, the Regional Project Manager, a Physical Protection Specialist, a Contracting Officer and an Infrastructure Development Coordinator. Along with the direct Africa and Middle East team members, there are additional IMPP staff that provide assistance on various tasks such as; topical subject matter experts that conduct training courses in the region (i.e. regulatory development, response force training, security management, inspections, etc.) and administrative staff that assist in various disciplines from contracting, to travel assistance and general administration.

### 1.3 Purpose

The purpose of this document is to describe PNNL's activities in support of GTRI to improve security at civilian nuclear and radiological sites in Africa and Middle East in order to protect at-risk materials, and elaborate on the different strategies GTRI uses to accomplish their goal. It will encompass PNNL's strategies, activities and estimated costs for 2012 to implement and sustain the upgrades for the foreseeable future. In addition, it will provide a description of the ongoing cross-cutting projects and collaboration with other international organizations working in the region.

## 2.0 AFRICA AND MIDDLE EAST REGIONAL STRATEGY

### 2.1 Background

As part of its mission, GTRI seeks to work with countries in Africa and the Middle East to enhance the physical protection and/or dispose of high-risk nuclear and radiological materials. PNNL initiated work in the region during Fiscal Year (FY) 2004 in a limited capacity and since that time has expanded cooperation to 24 countries within the region and completed security upgrades at 110 facilities as of December 31, 2011.

The region possesses a large quantity of high-risk radioactive sources. This regional project plan will document the strategies used by PNNL to implement GTRI projects, summarize work that has been completed, describe ongoing activities and provide a future outlook.

## 2.2 Overview of the Africa and Middle East Region

The Africa and Middle East region presents unique challenges for GTRI. The region contains many of the world's poorest countries, yet numerous radioactive sources and nuclear materials exist in several countries. Radioactive sources are used in various fields and commonly found in the following industries in Africa and the Middle East:

- Medical Industry – for the treatment of cancer patients or sterilization of blood
- Oil Industry – for oil exploration
- Research – for various types of agricultural and biological research
- Irradiation – for sterilizing food, medical products, insects and other items
- Radiography – for use in industrial gauges and measurement equipment
- Calibration – for use in calibrating radiological equipment

Many countries lack the basic infrastructure associated with nuclear and radiological security and do not have full regulatory control of these materials in the industries described above and are vulnerable to theft and sabotage.

The region has experienced many documented terrorist incidents since 2001 and a strong terrorist presence still exists and is growing in some locations within the region. The region is also home to many radicals and terrorist training camps. Many of the terrorist incidents carried out or attempted in other regions of the world originated from the Africa and Middle East region. In addition, many African countries are experiencing cross-border, civil and tribal conflicts and have unstable governments. The combination of lack of adequate material control, political instability and high terrorist presence makes the nuclear and radiological materials in Africa and Middle East perhaps the most vulnerable in the world. It is critically important that GTRI work with as many countries in the region as possible to enhance the security, control and long-term sustainability of these systems to reduce the threat of an improvised nuclear device (IND) or RDD.

Africa and the Middle East contain hubs for terrorist networks such as Al-Qaeda as continuously reported by the media and nongovernmental organizations about terrorist activities in the region. The threat of theft or sabotage of radiological or nuclear materials in these terrorist occupied countries is critically important to GTRI. There have been numerous documented reports of terrorist activities in the region and some are provided in the table below as well as large-scale bombings targeted at the United States. Many other terrorist acts that have occurred in other regions of the world, such as Europe, U.S. and others, not shown below, have been conducted or carried out by many terrorists that are trained or originated from within the Africa and the Middle East region. For example, one of the most recent high profile attempts were several bomb blasts that occurred in Northern Nigeria targeting Christmas Day church services. Just two years before a Nigerian-born terrorist failed in his attempt to blow-up a U.S. passenger flight over Detroit on Christmas Day, 2009. The suspect, Abdul Farouk Umar Abdulmutallab, was a Nigerian student who attempted to carry out this act of terrorism on behalf of Al Qaeda in Yemen. Because of the numerous terrorist incidents and other factors outlined above, the Africa and Middle East region is a critically important to reduce the threat of a nuclear or radiological act of terrorism.

Table 1. Published Terrorist Incidents in the Africa and Middle East Region Since 2001

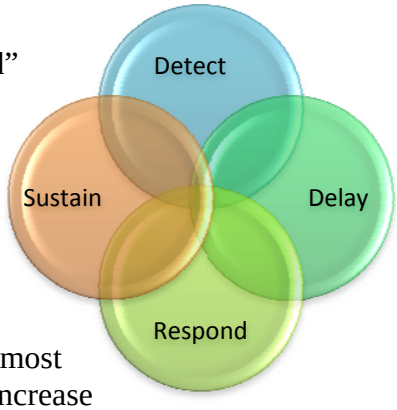
| Location | Description of Incident |
|---|---|
| Nigeria (December 2011) | Several bomb blasts and shootings occurred across the northern Nigerian cities of Jos, Gadaka, Damaturu and Madalla, just outside the capital Abuja, targeting Christmas Day church services. http://en.wikipedia.org/wiki/List_of_terrorist_incidents,_2011#December |
| Morocco (April 2011) | A bomb exploded in a cafe in the city of Marrakech killing 17 and wounding 20 people. http://en.wikipedia.org/wiki/List_of_terrorist_incidents,_2011#April |
| Sana'a Yemen (April 2010 | A suicide bomber disguised as a schoolboy attempted to kill the British ambassador to Yemen, Tim Torlot, when he threw himself into the path of the convoy Tim was travelling in. http://en.wikipedia.org/wiki/List_of_terrorist_incidents,_2010 |
| Namibia (September 2009) | Three suspects were arrested for being in possession of, and allegedly wanting to deal in, 170 kg (375 pounds) of uranium oxide. http://allafrica.com/stories/printable/200909080615.html |
| Kuwait (August 2009) | Kuwaiti authorities arrest members of Al Qaeda-linked group plotting attacks against large Shuaiba oil refinery, Kuwait's State Security Building, and Camp Arifjan (U.S. Army logistics base to support troops in Iraq). http://www.gulfnews.com/opinion/editorial_opinion/region/10339793.html |
| Somalia coast, Somalia (April 2009) | Somali pirates hijacked the Maersk Alabama and held hostage Captain Richard Phillips. U.S. Navy Seal snipers killed three of the pirates and freed Captain Phillips. Despite the presence of U.S. warships guarding the area, piracy continues to affect shipping through the area. http://www.msnbc.msn.com/id/30178013/ |
| Sana'a, Yemen (November 2008) | Six attackers from an Al Qaeda-linked group disguised as Yemen policemen attacked the U.S. embassy blowing up a car outside the compound killing 16. The attackers used a second car to launch rocket-propelled grenades at security forces. http://www.bloomberg.com/apps/news?pid=20601087&sid=afHE5JQEJyII&refer=home |
| Algeria (December 2007) | Multiple Al Qaeda terrorists armed with two car bombs attacked and killed 62 people near Algeria's Constitutional Council and the United Nations office. http://www.reuters.com/article/topNews/idUSL1140470820070411?src=041107_1207_TOPSTORY_qaeda_claims_attacks |
| Pelindaba, South Africa (November 2007) | Four armed men broke into the Pelindaba nuclear facility. The four intruders were technically sophisticated, deactivating several layers of security, including a 10,000-volt electrical fence, suggesting insider knowledge of the system. They stole a computer from the emergency control room and entered an electronically sealed control room before alarms were sounded and a response was initiated. http://www.washingtonpost.com/wp-dyn/content/article/2007/12/19/AR2007121901857.html |
| Syria (September 2007) | In September 2007, Israel bombs a site in Syria, which Damascus says is an unused military facility. The United States alleges later the site was a nuclear reactor, based on a North Korean design, intended for use in an atomic weapons program using plutonium. Syria denies it has any nuclear project or deal with North Korea, as does Pyongyang. |
| Damascus, Syria (September 2006) | Four armed Islamist militants attempt to blow up U.S. embassy with a large vehicle bomb. One guard was killed and 11 people were injured in the foiled attack. http://www.guardian.co.uk/world/2006/sep/12/usa.syria |
| Amman, Jordan (November 2005) | A series of coordinated attacks by Al Qaeda group were launched on three Western hotels killing 60 and injuring 115. Four suicide bombers conducted the coordinated attack. http://www.time.com/time/world/article/0,8599,1128209,00.html |
| Sharm el Sheikh, Egypt (July 2005) | A series of three bombings by militant Islamic group on resorts killed 88 individuals. A car bomb and truck bomb were used in the attacks. http://www.nytimes.com/2005/07/24/international/middleeast/24egypt.html |
| Jeddah, Saudi Arabia (December 2004) | Five militants using automatic weapons and grenades attacked a fortified entrance at the U.S. consulate, killing five. http://www.time.com/time/magazine/article/0,9171,971225,00.html |
| Saudi Arabia (December 2004) | Five militants attacked the U.S. consulate, killing five employees. http://www.time.com/time/magazine/article/0,9171,971225,00.html |
| Libya & Others (November 2004) | In 2004, nuclear scientist Abdul Qadeer Khan, father of Pakistan's atomic bomb, admits on television that he leaked nuclear secrets to Iran, North Korea and Libya. He later retracts his remarks. |
| Sinai Peninsula, Egypt (October 2004) | Multiple Three Egyptian tourist resorts on the Sinai peninsula were attacked by suicide bombers and car bombs leaving 34 dead. The car and suicide bombs are considered to be connected with Al Qaeda. http://news.bbc.co.uk/2/hi/middle_east/3725662.stm |

| | |
|---|---|
| Khobar, Saudi Arabia (May 2004) | 4 attackers Militant group attacks oil installation and complex housing foreign oil workers, hold 50 hostages and kill 22 of them. http://www.cnn.com/2004/WORLD/meast/05/30/saudi.shooting/index.html |
| Casablanca, Morocco (May 2003) | 14 attackers Fourteen suicide bombers attacked various locations in Casablanca, including: Casa de Espana restaurant, Hotel Farah, Jewish Cemetery, Jewish Community Center, a Jewish owned Italian restaurant and the Belgian consulate. Thirty-three civilians were killed in the attack along with 12 of the suicide bombers. The two remaining bombers were arrested. http://news.bbc.co.uk/2/hi/africa/3035803.stm |
| Riyadh, Saudi Arabia (May 2003) | Two heavily armed assault teams attacked a housing compound for Westerners killing 35 and wounding over 160. The attackers used four vehicles packed with explosives and heavily armed assault teams and killed and wounded security guards to enter the compound. http://www.voanews.com/english/archive/2003-05/a-2003-05-13-36-Saudi.cfm?moddate=2003-05-13 |
| Mombasa, Kenya (November 2002) | Multiple Al Qaeda group possibly linked to attacks on Israel owned hotel with car bomb killing 13 and injuring 80 followed by firing of two shoulder launched surface-to-air missiles at an Israeli-chartered plane. http://news.bbc.co.uk/2/hi/africa/2525931.stm |

## 2.3 GTRI Activities

GTRI cooperates with countries and facilities to implement a wide range of threat reduction activities. These include:

- Security upgrades at radiological facilities. GTRI's physical protection approach is to implement "a target-out" and "balanced" system. This means the bulk of the security elements are concentrated on the source and immediate vicinity, which is referred to as the "target" or "inner security layer" and gradually decreases in the outer security layers. GTRI designs security systems with equivalent levels of security at each layer, along all pathways to create a balanced approach. Security upgrades are also implemented in a graded manner to ensure the most attractive materials, from a terrorist's point of view, receive the increase protection elements and less attractive materials receive a commensurate amount of protection. The security systems include elements of detection, delay, and response. GTRI also strives to provide additional assistance including: security system installation, hardening of facilities, a minimum three-year warranty and preventative maintenance plan, security related training at the site and national levels, procedure development and assistance to sustain the security systems for the long-term.




- Consolidation of disused radiological sources to a safe and secure source storage facility. GTRI can provide assistance for items such as packaging, transport and storage containers, loading, unloading, and security of the storage area. The actual transportation of sources is generally not covered under a consolidation project as there tends to be a lack of liability coverage in most of the countries in this region;

- Repatriation of disused radiological sources from vulnerable locations back to the country of origin;

- Construction of safe and secure source storage facilities, where appropriate, to ensure adequate security of orphan and disused sources;

- Training of personnel on a range of topics for security and protection of radiological materials. Training is provided to site level and national level personnel in an effort to sustain the physical protection of radiological sources;

- Sustainability of completed work at sites. Sustaining the physical protection of materials typically involves cooperative efforts with national authorities and site level management. GTRI can provide national level assistance including: regulatory development, accounting and control of nuclear and radiological materials; inspector training, facilitating the development of national response plans and national recovery plans; response force training; and other training opportunities related to the protection of radioactive sources. Site level sustainability efforts are also needed to ensure the protection systems and procedures are compliant with national laws and regulations, and licensing requirements. This may require technical assistance and training of the site level management so that they understand and can implement any needed changes that will be enforced by the national authorities.

PNNL provides assistance to national and site level stakeholders to implement programs in support of the long-term sustainability of GTRI's installations. During the initial upgrades phase, PNNL includes sustainability measures such as development of security procedures for site operators, training on use of the security equipment and implementation of security procedures, three-year warranty and preventative maintenance for the equipment, and three years of offsite monitoring. During the warranty period, the teams continue to engage with the countries and conduct at least one visit per year (if possible) to visit as many sites as practical to view progress, reassess and determine whether additional security enhancements or sustainability measure are necessary. Additional sustainability measures include, but are not limited to regulatory development, training for inspectors, response force enhancements and training, and other activities and training related to the protection and control of nuclear and radiological materials. Appendix 2 is represents a graphical representation of the activities that have been conducted or are ongoing in the region.

GTRI is prohibited from working with countries which the U.S. has applied political and economic sanctions. Sanctions can be enforced or lifted at any time, but the rapidly changing political landscape in the region (i.e. political uprisings in Tunisia, Egypt, Yemen, and Libya) does affect PNNL's ability to provide assistance or engage some countries. Also, since this is a voluntary program for the foreign governments and individual sites, participation in GTRI's offer of assistance to protect the materials of concern is not guaranteed.

## 3.0 AFRICA AND MIDDLE EAST WORK SCOPE

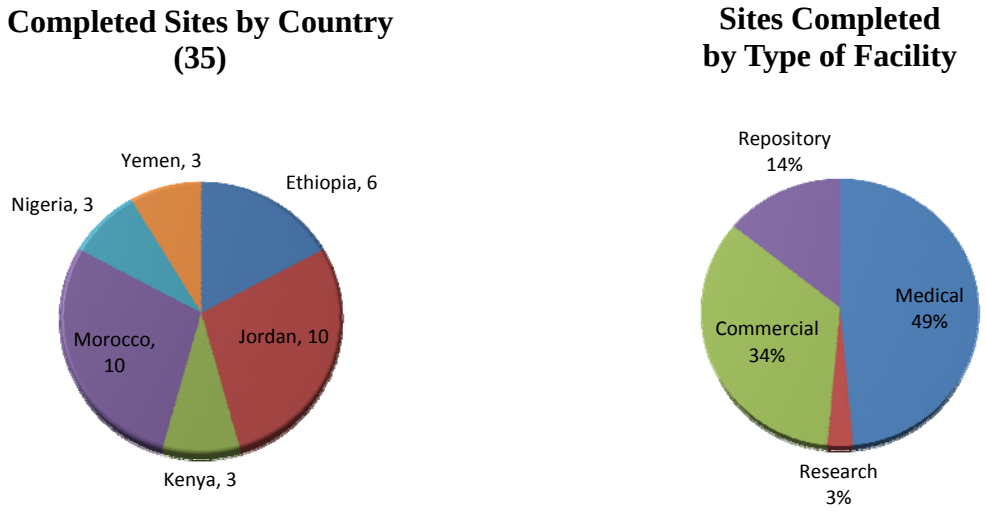
### 3.1 Radiological Protect Overview

PNNL's largest involvement in the GTRI program is on nuclear and radiological security activities. Relative to other regions in the program, the Africa and Middle East Region is

relatively immature in terms of the cooperation in the region. PNNL is working with several industries that use or store radiological materials and continues to develop and implement strategies to expand cooperation to additional countries in the region.

As of December 2011, PNNL has completed security upgrades at 35 facilities in six of the nine African and Middle Eastern countries that PNNL has engaged. An upgrade project is considered complete once all the contracted security elements have been installed, performance tested, operational procedures and training provided to operators and adequate assurances are provided to PNNL, such as written reports with accompanying before-after photos or actual site assurance visits are conducted by PNNL staff. Figure 1 shows the number of completed sites by country and by type of facility (i.e. medical, research, commercial, or repository).

Figure 1. Graphical representation of the number of completed sites by country and the types of sites that have been completed as of December 2011




## 3.2 Fiscal Year 2012 Radiological Protect Efforts

Each fiscal year NA-21 is obligated to meet established joule metric goals that are reported to Congress to measure the program's progress. In the Radiological Protect realm of GTRI, a joule metric is considered a single protected building that contains radioactive source(s) of interest to GTRI. In FY2012, PNNL received a budget allocation of $2.4 million for protect activities in the Africa and Middle East Region. This budget allocation was for completing new metric sites, infrastructure development activities, training and other sustainability activities. PNNL is committed to completing four new joule metric sites in fiscal year (FY) 2012 based on this budget allocation. It is forecasted that PNNL will complete ten metrics in FY2012.

See Appendix 3 for PNNL's basis of estimate for anticipated work to be funded in FY2012.

## 3.3 Radiological Removals

As part of GTRI's mission to reduce and protect vulnerable radiological materials, removal of these materials provides a comprehensive approach to achieving this mission.

Removal efforts result in a permanent threat reduction by eliminating materials at civilian sites. To date only one radiological removal project has been completed in the region. In January 2010 GTRI assisted in removing eight disused radiological sources from Israel and repatriated them to the U.S. In the future, GTRI plans to assist Egypt in removing disused sources from radiological facilities and consolidating them at a safe and secure source storage facility.

GTRI cooperates with countries and the IAEA to remove disused vulnerable material within a country to a secure source storage facility. The IAEA is engaged in providing similar assistance to IAEA member states within the region. Due to legal limitations on funding the transportation of radiological material GTRI seeks the cooperation of IAEA and IAEA donors, to assist with consolidation of sources to provide secure storage for otherwise vulnerable materials. For example, in Nigeria GTRI is working with the Nigerian regulatory authority and the IAEA to address the problem of securing several disused sources in the country. GTRI assisted in the expansion of an existing source storage building to house the large number of disused sources in the country that have been identified through cooperation with the Nigerian regulatory authority and the IAEA. The IAEA plans to package, collect and transport the sources to the new facility once GTRI has constructed it and provided adequate security systems.

GTRI continues to work with national regulatory authorities and the IAEA in countries where disused sources are found to be in vulnerable locations and help secure them at a source storage facility. Consolidating disused sources to a secure facility reduces the threat as there are fewer target locations available and reduces the number of vulnerable sources within a country.

## 4.0 FUTURE PROTECT PROJECTS

### 4.1 PNNL's Engagement Strategy

There are 41 remaining countries in the Africa and Middle East region where GTRI has not assigned efforts to a particular national laboratory or other entity. Again refer to Appendix 1, GTRI Engagement in Africa and Middle East, to identify those countries which are currently assigned to a National Laboratory and those that are not yet engaged into the program (countries shown in grey). The source categorization and types of radioactive sources in a country are the driving force behind GTRI's cooperation. There are a number of challenges associated with locating radioactive sources. The IAEA has published public databases for various types of medical irradiators and limited industrial irradiators for member states; however there are no public domain lists of blood or insect irradiators which are quite common in the Africa and Middle East region. The IAEA database is also not an all inclusive data point but does provide information about potential sources in countries where GTRI would otherwise not possess source information.

Public domain information on the national inventories of the countries in this region is limited and difficult to obtain. It is common that the national regulatory authority in country, if such an organization exists, does not have an accurate and complete accounting of the radiological materials in country and may require technical and financial assistance to develop a verified inventory. Therefore, other creative and time consuming efforts to obtain inventory information must be coordinated with the country representatives and other sources, such as the

IAEA, for IAEA member states, U.S. Embassies, neighboring countries and open source information.

In order to implement GTRI's mission and achieve its goals of securing vulnerable radioactive sources, PNNL will develop a targeted engagement strategy, outlined below, to initiate cooperation with those countries not yet engaged with the program.

**Engagement Methodology:** All countries in the Africa and Middle East region will be analyzed to determine the likelihood and extent of radioactive source use, and the level of each country's active participation in the non-proliferation community (described below). GTRI has active cooperation with countries that meet these criteria; however, there are many countries in the region that likely have a high probability of possessing high activity radioactive sources based on the industries in the countries and activity in the non-proliferation community.

- Likelihood: Each country will be analyzed using a combination of information obtained by GTRI Project Teams, open source information, and an evaluation of industries in the country that typically use radioactive sources (i.e. radiotherapy, oil exploration, and industrial radiography.

- Activity in the Non-Proliferation Community: Non-Proliferation activities are carried out by various organizations including NNSA[1], other U.S. Government programs[2], the IAEA[3], WINS[4] and intra-African bodies such as the Forum of Nuclear Regulatory

[1] NNSA Coordination (NA-24, NA-25, NA-40): GTRI's sister programs support the security of nuclear and radioactive sources at different points on the nuclear nonproliferation spectrum. There is opportunity for additional cooperation at the transition points of each Program or in areas where they may overlap with GTRI scope. For example, secure storage of orphan sources at ports of entry and response to security alarms prior to a "Dirty Bomb" event. GTRI will cooperate with its sister programs to develop synergies and leverage relationships that GTRI can use to initiate cooperation in new countries or further cooperation in existing countries.

[2] Other U.S. Government agencies: Other U.S. Government agencies may conduct projects that complement the GTRI's scope including the State Department, Nuclear Regulatory Commission (NRC) and others. Some examples include:

a. The State Department's Nuclear Smuggling Outreach Initiative (NSOI) to enhance international partnerships to combat smuggling of nuclear and radioactive materials. The NSOI facilitates the development of an action plan and list of projects that received high-level support between both Governments. The NSOI may provide new avenues for cooperation in the region where direct cooperation between the partner country and GTRI have stalled, or in countries where greater coordination with the U.S. Department of State is required.
b. The Partnership for Nuclear Security is another State Department led program in which the GTRI team has attempted and could continue to identify synergies to benefit both parties when working in the same region.

[3] IAEA Protect Coordination: The IAEA is interested in assisting African and the Middle Eastern countries to build national capacities to implement the nuclear and radiological security regimes, and enhance the physical protection, control and accounting of nuclear and radiological materials. GTRI and the IAEA have coordinated on efforts in many countries and this coordination should continue. Those countries where GTRI and the IAEA are both working on site upgrades include the following: Ghana, Kenya, Nigeria, South Africa, and Tunisia. The IAEA has a wealth of knowledge and cooperation with other organizations such as Interpol who are all working in the region on nuclear and radiological issues. Our unique relationship with the IAEA could also be leveraged to become involved in, EU and other organizations' events being held within the region.

Bodies of Africa (FNRBA)[5]. A country's active participation within these communities provides an indication of source use within the country, and their willingness to cooperate with the GTRI Program.

- Regional Cooperation: PNNL will encourage regional partnerships among neighboring countries to enhance the control and security of radioactive sources. This could be accomplished by leveraging existing GTRI relationships[6] to foster regional activities and partnerships on security matters, GTRI supporting or hosting regional workshops[7] or providing regional training opportunities.[8]

**Targeted Countries:** Countries will be analyzed to determine the likelihood of having radioactive sources in the country and those countries will be targeted for engagement in the coming year and out years. Due to programmatic and financial constraints GTRI limits the

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[4] WINS: The World Institute of Nuclear security (WINS) provides an international forum to share and promote the implementation of best security practices. At times, WINS hosts regional meetings that may provide avenues for GTRI team members to conduct outreach by attending or participating in these international seminars or conferences directed toward the Africa & Middle East Region.

[5] Forum of Nuclear Regulatory Bodies in Africa: The FNRBA was established in 2008 with the assistance of the U.S. Nuclear Regulatory Commission, and was created to provide a forum for the exchange of information, experiences, and expertise on radiological safety and security between regulatory bodies in its member countries. GTRI has existing relationships with several key members of the Steering Committee including the current chairman from Nigeria, which may enable GTRI's participation and influence on radiological security matters. Moreover, the FNRBA would provide an ideal setting to build networks with countries where GTRI has not initiated cooperation.

[6] Leverage Existing Relationships: Since 2004, GTRI has developed strong relationships with several of the countries that are currently engaged in the Program. For the remaining countries GTRI will leverage existing relationships with African and European countries to initiate multilateral cooperation and develop sub-regional partners. Partnerships will be focused on those countries that are considered to be strong proponents of nuclear/radiological security and have shown the capacity to build networks with their counterparts throughout the region. A primary example of the success of this approach is Morocco, which helped to host an Africa and Middle East Regional Workshop on the Implementation of Sustainable Radiological Security in June 2010. Examples of other candidate countries include Ghana, Jordan, Kenya, Nigeria, South Africa, Tanzania, and others.

[7] Regional Workshops: An Africa and Middle East Regional Workshop on the Implementation of Sustainable Radiological Security was held in June 2010. Over 80 representatives attended from 28 countries in the region, and many new contacts were made. This regional workshop provided the participants with information about GTRI, highlighted experiences from other country representatives, and promoted the assistance available through GTRI related to source security and sustainability. It was also an opportunity to cooperative with other NNSA offices (NA-40 presented) and the IAEA (representatives from the Nuclear Security and Waste Technology sections presented). Future regional workshops will be considered to foster regional cooperation on nuclear and radiological security, and promote GTRI priorities.

[8] Search & Secure The GTRI's Search & Secure Program has played an important role in initiating and strengthening cooperation in several countries within the Africa & Middle East Region. The Search & Secure Program can continue to serve in that role by offering it to targeted countries. To date the Search and Secure team has trained representatives in the following countries: Burkina Faso, Cameroon, Cote d'Ivoire, DR Congo, Egypt, Gabon, Ghana, Jordan, Kenya, Mauritius, Namibia, Nigeria, Rep. Congo, Tanzania, Tunisia, Uganda, and the United Arab Emirates.

financial support to those countries that are considered high-income[9] countries by the World Bank[10]. GTRI does permit technical cooperation so those countries will not be excluded from the engagement strategy. On the other hand, the U.S. government does not permit cooperation in countries where current diplomatic prohibitions are in place.[11]

There are likely African and Middle Eastern countries where there is a small probability of the use of highly radioactive sources. GTRI will use its relationships with neighboring countries to learn more about potential source use in these countries, and will continue to invite them to regional meetings to raise awareness on the topics

## 4.2 Prioritization

The GTRI program has instituted a risk-based system for prioritizing work within the program. This risk-based prioritization methodology provides a systematic process to rank projects and assign resources based on the relative risk of the material and the expected risk reduction resulting from planned GTRI activity (i.e. protection or removal of material). The prioritization factors are:

- Nuclear and radiological material attractiveness level
- World Bank categorization of country
- Existing site security conditions
- Country threat environment, and
- Location (proximity of source/material to strategic asset)

Within the Africa and Middle East region, the first step in prioritization is to determine where the large radioactive sources are in the region. The five most common uses of high activity radioactive sources found in Africa and the Middle East are teletherapy machines, blood irradiators, insect/food irradiators, source storage facilities, and research reactors. The IAEA Directory of Radiotherapy Centers[12] database contains information on cancer therapy machines throughout the world and is a tool used by GTRI to identify potential teletherapy source locations within a country.

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[9] High-Income Countries in the Middle East: Many countries in the Middle East region are considered High Income and are not eligible for financial assistance such as funding physical protection upgrades. However, radioactive sources are widely used in many of these countries and the facilities and regulatory bodies could benefit from technical expertise from GTRI. Cooperation could come in the form of technical exchanges, joint site assessment, training, and other capability development activities. PNNL will seek to initiate cooperation with these countries through regional meetings and training activities, such as those organized by the IAEA, WINS, GTRI and other organizations. Cost sharing arrangements will be utilized to the greatest extent possible.

[10] World Bank Country Classification website: http://econ.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~isCURL:Y~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[11] There are currently seven countries throughout the region in which GTRI is restricted from initiating cooperation. PNNL will continue to work with the U.S. Department of State to monitor the diplomatic prohibitions in these countries and initiate cooperation as allowed by the U.S. Government.

[12] The IAEA Directory of Radiotherapy Centers can be located at: http://www-naweb.iaea.org/nahu/dirac/login.asp

Establishing a relationship with a country can be a long and difficult process. In addition to locating high priority sources, another challenge PNNL faces is a country's regulatory body can be difficult to identify. PNNL will use various strategies described in the previous section to obtain information to help prioritize the remaining countries. In addition, PNNL must adapt to the unique circumstances in the region and take them into consideration when prioritizing projects within the region. Some of these characteristics include:

1. GTRI's ability to work in a country (i.e. non-sanctioned countries)
2. A country's willingness to cooperate with GTRI/PNNL
3. Countries or areas within countries where PNNL personnel are unable to safely travel (i.e. war zones, high-risk or dangerous areas).

Most of the countries that GTRI have engaged to date (identified on the map in Appendix 1) are those countries GTRI had previously identified as most likely to possess large material attractiveness level one and two sources and that have been willing to participate in the GTRI program.

### 4.3 Future Outlook (Short-term and Long-term Goals)

One of the primary threat reduction goals of GTRI is to protect high priority nuclear and radiological materials from theft and/or sabotage. Protection of these materials achieves GTRI's threat reduction goals because each vulnerable building containing potential weapons of mass destruction (WMD), IND or RDD material that is protected reduces the risk of theft and/or sabotage until a permanent solution can be implemented.

GTRI's 2010 change in program guidance has had a major impact on the work scope the Africa and Middle East region due to the lowering of the thresholds of nuclear and radioactive sources eligible for GTRI funded upgrades. This change will significantly increase the number of sites as new radiological sites meet the reduced thresholds for GTRI assistance.

Since GTRI's physical protection criteria have become more stringent and encompassing, current and future budgets must increase to match the new requirements. In the short term, PNNL will contact existing countries (see Appendix 1) to determine the impact of the new thresholds on scope, schedule and funding. Annual project plans will be developed, such as this, for implementation of GTRI cooperation at new sites meeting the requirements of the program guidance. PNNL will consider the GTRI prioritization factors (reference Section 4.2) when addressing the additional sites if there are limits to time or available funding.

Sustainability of previously implemented security upgrades is critical to the long-term success of GTRI's physical protection program. Sustainability activities include capacity building activities to enhance a country or site's ability to control, account for, secure, and enforce laws, regulations and licensing requirements for the protection of nuclear and radioactive sources in the country.

The Africa and Middle East Region contains a relatively small number of nuclear facilities and the changes in the recent changes in GTRI's programmatic guidance will allow PNNL to pursue protection activities at some of the facilities that did not qualify in previous years. The research reactors in the region are located in: The Democratic Republic of Congo, Egypt, Ghana, Libya, Morocco, Nigeria and South Africa. Jordan also has plans to build a research reactor within the next five years (2015). PNNL has assessed the reactor in Morocco during FY2011 and plans to provide additional protection measures during FY2012 (reference Appendix 2 Basis of Estimate). Previous GTRI programmatic restrictions halted efforts to protect the reactors in Ghana (Lawrence Livermore National Laboratory) and Nigeria (PNNL); however, through cooperative efforts with the IAEA has implemented upgrades in both countries. In the Democratic Republic of Congo GTRI is attempting to reach an agreement with the Congolese to remove the nuclear fuel from their research reactor. The upgrades in South Africa were initiated in FY2010 through a lab-to-lab agreement between Sandia National Laboratories and Nuclear Energy Corporation of South Africa (NECSA).

Given appropriate funding, PNNL intends to assist GTRI in developing regional Centers of Excellence in selected countries in Africa and the Middle East that are seen as a major regional players in the area of nuclear and radiological security and the sustainment of such systems from both the national and site level. These Centers will provide a unique opportunity to promote, at the regional level, a culture of security on various issues: export control, illicit trafficking, engagement of scientists, nuclear and radiological security and source management. These centers will also facilitate collaboration between experts from not only the U.S., but also the European Union (EU), the IAEA and other international organizations and relevant authorities of the beneficiary countries. Exchanges of information and best practices among relevant national and regional authorities will be the cornerstone of this regional network.

## 5.0 CROSS-CUTTING PROJECTS

GTRI's cross-cutting projects are defined as those that have application in more than one specific project. These projects are managed, funded and executed separately from the GTRI Protect projects; however, cross-cutting activities within the region must be coordinated internally with GTRI's Project Managers and externally with the IAEA. Cross-cutting activities that are ongoing in the Africa and Middle East region include IAEA Coordination, Search and Secure and Remote Monitoring.

### 5.1 International Atomic Energy Agency Coordination

#### *5.1.1 IAEA Protect Coordination*

The IAEA is interested in assisting Africa and the Middle East to enhance the physical protection, control and accounting of nuclear and radiological materials and many provide funding to the IAEA to implement such projects. PNNL works closely with the IAEA since it has many technical cooperation and source security assistance projects ongoing in many of the PNNL managed countries. Within the region, PNNL and IAEA are working some of the same countries, and in some cases even at the same facility to provide assistance to enhance the security of the nuclear and radioactive sources. PNNL and the IAEA have a positive working relationship and regularly communicate respective progress in the

region to ensure efforts complement each other and that there is no duplication of efforts. Each organization has its own guidelines and criteria for implementing projects and they overlap in many areas; however, each organization has elements that the other is not able to provide. This working relationship ensures that each organization performs its work most effectively and efficiently to provide the maximum benefit to the foreign counterpart.

### *5.1.2 IAEA Removals Coordination*

Through extra budgetary contributions to the IAEA Nuclear Security Fund and technical support from Los Alamos National Laboratory, GTRI, in conjunction with the IAEA and Nuclear Energy Corporation of South Africa (NECSA), developed a prototype mobile hot cell. This hot cell is intended to be used to remove high-activity beta/gamma sources from devices for consolidated secure storage or repatriation to their country of origin, thereby reducing the quantity of vulnerable radioactive sources in a country. The hot cell was tested in South Africa and was successfully deployed in Sudan (with EU funding) and Tanzania (with US funding). There are plans to initiate this activity in Morocco (PNNL managed country) in the future although no specific timeframe has been set.

## 5.2 Search and Secure

The Search and Secure project is a cross-cutting training program offered by GTRI to foreign governments to help with the issue of protecting orphan and disused sources. The goal of the Search and Secure project is to build a country's indigenous capacity to identify and address their orphaned and disused source problems. The Search and Secure project offers equipment and training to provide the country with the ability to:

- Perform a verified inventory and locate orphan sources;
- Organize a search team and implement a search for orphan sources;
- Use radiation detection and measurement equipment provided by the Search and Secure project;
- Characterize unknown sources;
- Package and transport or seek help to move sources.

The Search and Secure project provides a one week training course on the activities listed above, a suite of equipment necessary for each country to conduct its own searches and verified inventory and includes hands on field exercises. Through verified inventory and search contracts, GTRI supports a country's efforts to develop and/or verify their source inventory. Thus enhancing the regulatory body's ability to manage and control the radioactive sources in their country. As mentioned in Section 4.1, Search and Secure is also a strategy to engage new countries. Experience has shown that African countries are eager to obtain training and equipment and has been used as a conduit to initiate cooperation in several countries.

In the coming year PNNL will be coordinating with the Search and Secure teams to establish a training program and supply equipment to three countries: Morocco, Mali and Ethiopia.

## 5.3 Remote Monitoring

A critical component of GTRI's detection enhancements and "Alert and Notify" strategy is remote monitoring of security systems. In the Africa and Middle East region the organization conducting the remote monitoring could range from local or national law enforcement agencies, military or private security organizations. Remote monitoring systems have also been purchased by GTRI's centralized procurement to provide remote monitoring systems to high priority sites where it is practical to implement such systems. The remote monitoring systems that are used in the Africa and Middle East region are utilized as a backup system and provide a redundant capability of monitoring and transmitting alarm and video signals from site security systems to the offsite monitoring organizations (police, military, private security vendor, etc.).

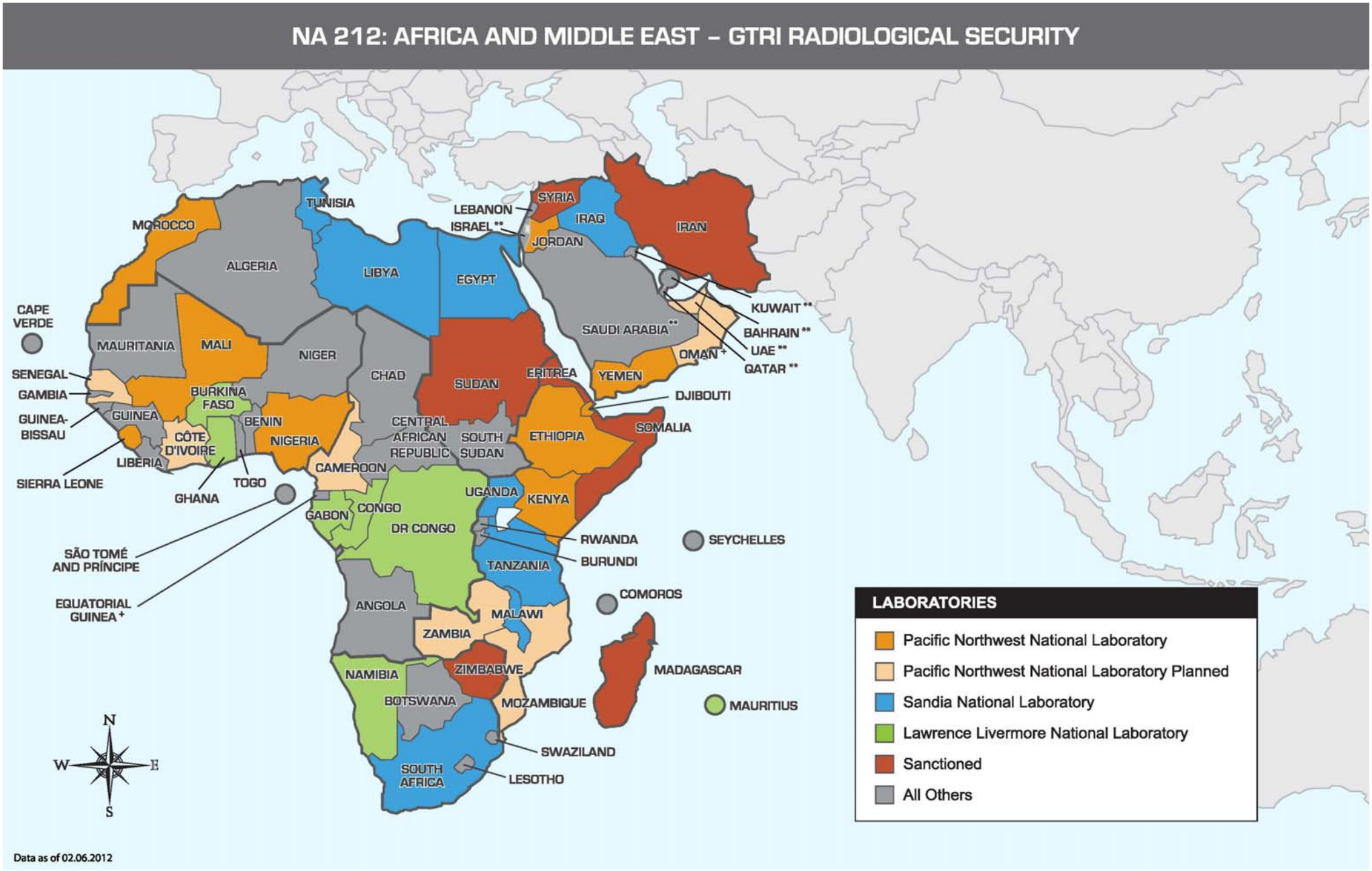
GTRI has established a program with the IAEA to provide and install remote monitoring systems internationally. The IAEA remote monitoring program is being utilized to implement remote monitoring systems in the Africa and Middle East region. Table 3 represents the remote monitoring system installations that have been installed by the IAEA in PNNL managed countries through December 2011. [13].

Table 3: IAEA Remote Monitoring Installations in GTRI Partner Countries Led By PNNL

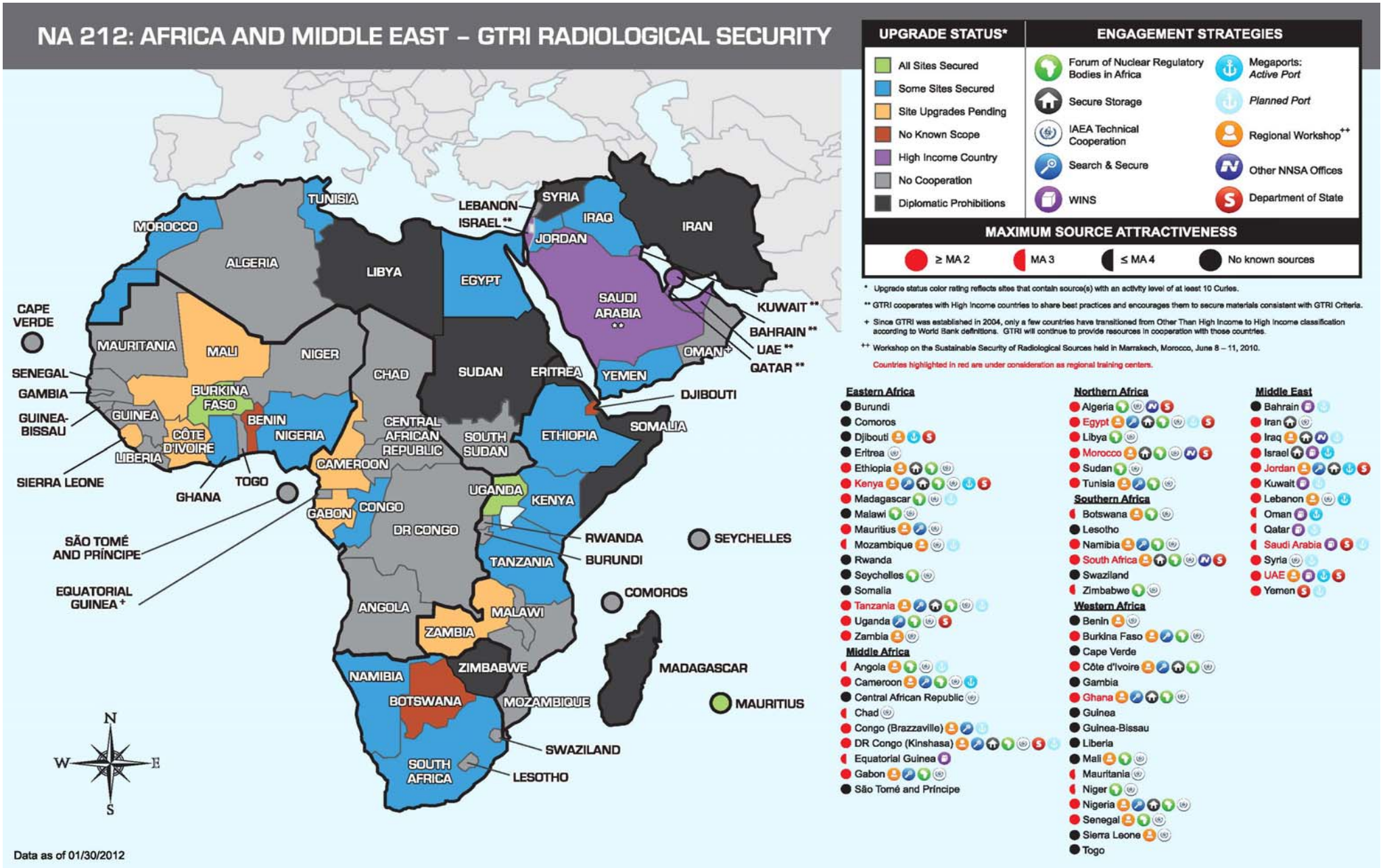
| Country | Site |
|---|---|
| Nigeria | Center for Energy Research & Teaching (CERT) Storage Facility |
| Nigeria | Research Reactor - NIRR-1 |

[13] Nigerian Nuclear Regulatory Authority Presentation, published on the IAEA's public website: http://www-pub.iaea.org/mtcd/meetings/PDFplus/2009/cn166/CN166_Presentations/Session%206/029%20Bello.pdf, Page 30 of 38.

**Appendix 1 - Africa and Middle East Regional Map of Existing Cooperation**



**Appendix 2 - Africa and Middle East Regional Map of Current Cooperative Activities**



**Appendix 3 – PNNL's FY2012 Basis of Estimate**

# *FY12 PNNL Basis of Estimate - Africa/Middle East*

***TOTAL PNNL FUNDING FOR FISCAL YEAR 2012*** ***$2,400,000***

## *Ethiopia*

Proposed Activities/Contracts:
- CSF WMM (March)
- Tse tse Fly Irradiator (Feb)
- Response Training (Aug)
- Regulatory Development

***Projected FY12 Joule Metrics:*** ***1***

***Projected FY12 Infrastructure Development Activities:*** ***2***

## *Jordan*

Proposed Activities/Contracts:
- Al-Bashir Follow-On (Jan)
- King Hussein Follow-On (Jan)
- Gamma Knife Follow-On (Jan)
- Royal Medical Center Follow-On (Jan)
- JAEC Follow-On (Jan)
- Response Training/ Follow-On (Mar)
- Physical Protection & Security Management Course

***Projected FY12 Joule Metrics:*** ***0***

***Projected FY12 Infrastructure Development Activities:*** ***2***

## *Kenya*

Proposed Activities/Contracts:
- Zaisco Ltd, Mombasa (Apr)
- Civicon Ltd, Mombasa (Apr)
- Weldcon Ltd, Mombasa (Apr)
- Quality Inspectors Ltd, Nairobi (Apr)
- Central Storage Facility Follow-On Upgrades (Sep)
- Temporary Storage at Port of Mombasa (Sep)
- PP&SM Course Logistics (Mar)
- Response Force Training (Jul)

***Projected FY12 Joule Metrics:*** ***5***

***Projected FY12 Infrastructure Development Activities:*** ***2***

## *Mali*

Proposed Activities/Contracts:
Inaugural Trip to Initiate Cooperation

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***0***

## *Morocco*

ProposedActivities/Contracts:
CNESTEN: (Nov)
CNESTEN - Medical Isotope Laboratory
CNESTEN - Calibration Laboratory
CNESTEN - Research Reactor
Hassan-II Follow-On (Feb)
Tangier Irradiator Follow-On (Jul)
Offsite Monitoring (Feb)
CNESTEN International Training Center (Mar)
Response Training (Apr)
PP&SM Course Logistics (Oct)

***Projected FY12 Joule Metrics:*** ***3***
***Projected FY12 Infrastructure Development Activities:*** ***2***

## *Nigeria*

Proposed Activities/Contracts:
Response Training (Jun)
Physical Protection & Security Management Course

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***2***

## *Oman*

Proposed Activities/Contracts:
Inaugural Trip to Initiate Cooperation

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***0***

## *Sierra Leone*

Proposed Activities/Contracts:
Inaugural Trip to Initiate Cooperation

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***0***

## *Yemen*

Proposed Activities/Contracts:
Warranty/Maintenance for National Oncology Center

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***0***

## *Djibouti*

Proposed Activities/Contracts:
Temporary Storage (Aug)

***Projected FY12 Joule Metrics:*** ***1***
***Projected FY12 Infrastructure Development Activities:*** ***0***

## *UAE*

Proposed Activities/Contracts:
Initiate cooperation and conduct joint activity on source security

***Projected FY12 Joule Metrics:*** ***0***
***Projected FY12 Infrastructure Development Activities:*** ***0***

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