

GLOBAL THREAT  
REDUCTION INITIATIVE

# STRATEGIC PLAN

## JANUARY 2009



REDUCING NUCLEAR AND  
RADIOLOGICAL THREATS  
WORLDWIDE



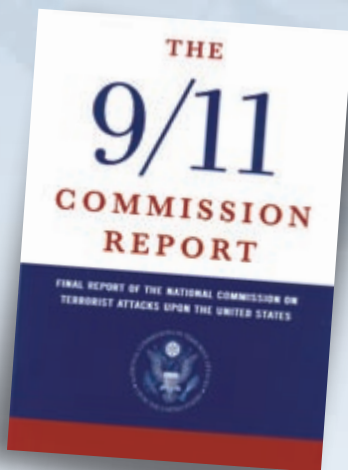
U.S. DEPARTMENT OF  
**ENERGY**



# BACKGROUND

"THE NEXT U.S. PRESIDENT WILL TAKE OFFICE STILL FACING A VERY REAL DANGER THAT TERRORISTS MIGHT GET AND USE A NUCLEAR BOMB....PREVENTING SUCH AN ATTACK MUST BE A TOP INTERNATIONAL PRIORITY....THE GOAL SHOULD BE TO REMOVE ALL NUCLEAR MATERIAL FROM THE WORLD'S MOST VULNERABLE SITES AND ENSURE EFFECTIVE SECURITY WHEREVER MATERIAL MUST REMAIN WITHIN FOUR YEARS OR LESS..."

PREVENTING NUCLEAR TERRORISM:  
AN AGENDA FOR THE NEXT PRESIDENT  
MATTHEW BUNN AND ANDREW NEWMAN  
NOVEMBER 2008

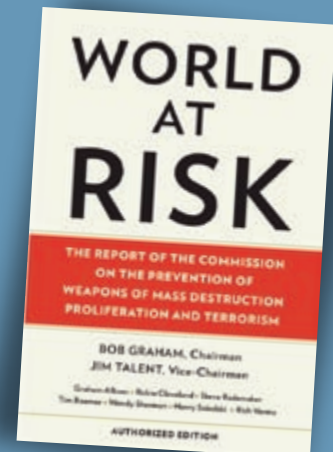


"THE HIGHEST PRIORITY FOR THE OBAMA PRESIDENCY MUST BE SECURING NUCLEAR WEAPONS AND MATERIALS TO PREVENT THEM FROM FALLING INTO DANGEROUS HANDS. THE LIKELIHOOD OF NUCLEAR TERRORISM MIGHT BE LOW, BUT ITS IMPACT WOULD BE DEVASTATING. OBAMA MUST MAKE IT A FIRM GOAL TO SECURE ALL FISSILE MATERIALS BEFORE THE END OF HIS FIRST TERM. IF TERRORISTS CANNOT GAIN ACCESS TO WEAPONS-GRADE MATERIALS, THEY CANNOT BUILD A NUCLEAR DEVICE. ACHIEVING THIS GOAL WILL REQUIRE CLOSE COOPERATION AND TRADE-OFFS WITH NOT ONLY RUSSIA BUT DOZENS OF COUNTRIES, BUT WE CAN IMAGINE NO THREAT MORE DIRE."

THOMAS H. KEAN AND LEE H. HAMILTON  
FORMER CO-CHAIRMAN, 9/11 COMMISSION  
WASHINGTON POST EDITORIAL  
NOVEMBER 2008

"THE COMMISSION BELIEVES THAT UNLESS THE WORLD COMMUNITY ACTS DECISIVELY AND WITH GREAT URGENCY, IT IS MORE LIKELY THAN NOT THAT A WEAPON OF MASS DESTRUCTION WILL BE USED IN A TERRORIST ATTACK SOMEWHERE IN THE WORLD BY THE END OF 2013."

COMMISSION ON THE PREVENTION OF  
WEAPONS OF MASS DESTRUCTION,  
PROLIFERATION AND TERRORISM  
DECEMBER 2008



# MISSION

GTRI'S MISSION IS TO REDUCE AND PROTECT VULNERABLE NUCLEAR AND RADIOLOGICAL MATERIAL LOCATED AT CIVILIAN SITES WORLDWIDE. GTRI SUPPORTS THE U.S. DEPARTMENT OF ENERGY'S NUCLEAR SECURITY GOAL BY PREVENTING TERRORISTS FROM ACQUIRING NUCLEAR AND RADIOLOGICAL MATERIALS THAT COULD BE USED IN WEAPONS OF MASS DESTRUCTION OR OTHER ACTS OF TERRORISM.

## A NATIONAL PRIORITY

"WE MUST...LEAD A GLOBAL EFFORT TO SECURE ALL NUCLEAR WEAPONS MATERIALS AT VULNERABLE SITES WITHIN FOUR YEARS"

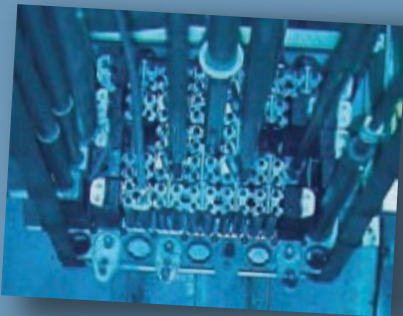
BARACK OBAMA  
JULY 2008

## GOALS

1. CONVERT
2. REMOVE
3. PROTECT

GTRI HAS THREE GOALS THAT PROVIDE A COMPREHENSIVE APPROACH TO ACHIEVING ITS MISSION AND DENYING TERRORISTS ACCESS TO NUCLEAR AND RADIOLOGICAL MATERIALS.

## CONVERT



CONVERT RESEARCH REACTORS FROM THE USE OF HIGHLY ENRICHED URANIUM (HEU) TO LOW ENRICHED URANIUM (LEU).

THESE EFFORTS RESULT IN PERMANENT THREAT REDUCTION BY MINIMIZING AND, TO THE EXTENT POSSIBLE, ELIMINATING THE NEED FOR HEU IN CIVILIAN APPLICATIONS — EACH REACTOR CONVERTED OR SHUT DOWN ELIMINATES A SOURCE OF BOMB MATERIAL.

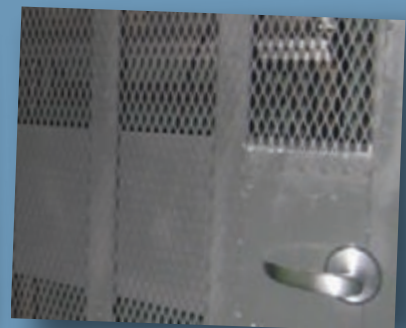
## REMOVE



REMOVE AND DISPOSE OF EXCESS NUCLEAR AND RADIOLOGICAL MATERIALS.

THESE EFFORTS RESULT IN PERMANENT THREAT REDUCTION BY ELIMINATING BOMB MATERIAL AT CIVILIAN SITES — EACH KILOGRAM OR CURIE OF THIS DANGEROUS MATERIAL THAT IS REMOVED REDUCES THE RISK OF A TERRORIST BOMB.

## PROTECT



PROTECT HIGH PRIORITY NUCLEAR AND RADIOLOGICAL MATERIALS FROM THEFT AND SABOTAGE.

THESE EFFORTS RESULT IN THREAT REDUCTION BY IMPROVING SECURITY ON THE BOMB MATERIAL REMAINING AT CIVILIAN SITES — EACH VULNERABLE BUILDING THAT IS PROTECTED REDUCES THE RISK UNTIL A PERMANENT THREAT REDUCTION SOLUTION CAN BE IMPLEMENTED.

# GLOBAL PARTNERS





# MATERIALS OF CONCERN

THE PRIMARY MATERIALS OF CONCERN FOR GTRI ARE NUCLEAR MATERIALS THAT COULD BE USED BY TERRORISTS TO FABRICATE A CRUDE NUCLEAR BOMB AND RADIOLOGICAL MATERIALS THAT WOULD BE MOST EFFECTIVE FOR A RADIOLOGICAL DISPERSAL DEVICE (RDD, ALSO REFERRED TO AS A DIRTY BOMB). OF PARTICULAR CONCERN ARE THE THOUSANDS OF CIVILIAN SITES WHERE NUCLEAR AND RADIOLOGICAL MATERIALS ARE USED FOR LEGITIMATE AND BENEFICIAL COMMERCIAL, MEDICAL, AND RESEARCH PURPOSES. THIS IS BECAUSE CIVILIAN SITES GENERALLY HAVE LESS PROTECTION THAN MILITARY STOCKPILES OF NUCLEAR MATERIALS.

## NUCLEAR MATERIALS

NUCLEAR MATERIAL IN THE FORM OF HIGHLY ENRICHED URANIUM (HEU) AND PLUTONIUM IS LOCATED AT HUNDREDS OF FACILITIES IN DOZENS OF COUNTRIES. EXPERTS AGREE THAT THE MOST DIFFICULT STEP FOR TERRORISTS SEEKING TO MAKE A CRUDE NUCLEAR BOMB IS THE ACQUISITION OF HEU AND PLUTONIUM. THE MOST LIKELY ROUTE FOR A TERRORIST TO ACQUIRE A CRUDE NUCLEAR DEVICE IS TO PURCHASE OR STEAL THIS MATERIAL.

NO TERRORIST ORGANIZATION IS BELIEVED TO HAVE THE CAPACITY TO PRODUCE NUCLEAR WEAPONS-USABLE MATERIALS, BUT HEU IS CURRENTLY USED AS FUEL FOR MANY CIVILIAN RESEARCH REACTOR FACILITIES. IN ADDITION, SIGNIFICANT QUANTITIES OF HEU AND PLUTONIUM ARE USED IN COMMERCIAL, MEDICAL, AND SCIENTIFIC ENDEAVORS SUCH AS ISOTOPE PRODUCTION AND SCIENTIFIC RESEARCH.

8 KILOGRAMS OF PLUTONIUM (ABOUT THE SIZE OF A SODA CAN) IS ALL THAT IS NEEDED TO MAKE A CRUDE NUCLEAR BOMB.

25 KILOGRAMS OF HEU (ABOUT THE SIZE OF A GRAPEFRUIT) IS ALL THAT IS NEEDED TO MAKE A CRUDE NUCLEAR BOMB.



# RADIOLOGICAL MATERIALS

MILLIONS OF RADIOACTIVE SEALED SOURCES ARE USED AROUND THE WORLD FOR LEGITIMATE AND BENEFICIAL COMMERCIAL APPLICATIONS SUCH AS CANCER TREATMENT, FOOD AND BLOOD STERILIZATION, OIL EXPLORATION, REMOTE ELECTRICITY GENERATION, RADIOGRAPHY, AND SCIENTIFIC RESEARCH. THESE APPLICATIONS USE ISOTOPES SUCH AS AMERICIUM-241, CALIFORNIUM-252, CESIUM-137, COBALT-60, CURIUM-244, IRIIDIUM-192, PLUTONIUM-238, PLUTONIUM-239, RADIUM-226, AND STRONTIUM-90.

MANY OF THESE RADIOLOGICAL SOURCES ARE NO LONGER NEEDED AND HAVE BEEN ABANDONED OR ORPHANED; OTHERS ARE LIGHTLY GUARDED, MAKING THE THREAT OF THEFT OR SABOTAGE SIGNIFICANT.

CURRENTLY, THERE ARE THOUSANDS OF CIVILIAN LOCATIONS WORLDWIDE WITH DANGEROUS HIGH ACTIVITY RADIOACTIVE SOURCES.



ORPHANED SOURCE  
RECOVERY EFFORTS  
IN CHECHNYA

1,000 CURIES OF  
RADIOACTIVITY  
(ABOUT THE SIZE OF  
A ROLL OF COINS)  
IS ALL THAT IS NEEDED  
TO MAKE A LARGE  
RADIOLOGICAL  
DIRTY BOMB.



# NUCLEAR TERRORISM

A TERRORIST DETONATION OF A CRUDE NUCLEAR BOMB OR RADIOLOGICAL DIRTY BOMB WOULD HAVE CATASTROPHIC CONSEQUENCES, WHICH COULD INCLUDE SIGNIFICANT FATALITIES AND CASUALTIES; EXTENSIVE INFRASTRUCTURE DAMAGE AND RADIOACTIVE CONTAMINATION THAT WOULD PROHIBIT USE OF THE AREA; AND ECONOMIC LOSSES IN THE BILLIONS OF DOLLARS.

THE THREE MAIN THREAT SCENARIOS ARE:

- TERRORISTS COULD ACQUIRE A NUCLEAR WEAPON WITH EXPLOSIVE POWER OF TENS TO A FEW HUNDRED KILOTONS.
- TERRORISTS COULD ACQUIRE HEU OR PLUTONIUM AND BUILD A CRUDE NUCLEAR BOMB WITH UP TO A FEW KILOTONS OF EXPLOSIVE POWER.
- TERRORISTS COULD ACQUIRE RADIOLOGICAL MATERIALS AND CONSTRUCT RADIOLOGICAL DIRTY BOMBS.

## JULY 2004

"THE GREATEST DANGER OF ANOTHER CATASTROPHIC ATTACK ... WILL MATERIALIZE IF THE WORLD'S MOST DANGEROUS TERRORISTS ACQUIRE THE WORLD'S MOST DANGEROUS WEAPONS... AL QAEDA HAS TRIED TO MAKE NUCLEAR WEAPONS FOR THE LAST 10 YEARS."

THE NATIONAL COMMISSION ON TERRORIST ATTACKS UPON THE UNITED STATES (9/11 COMMISSION)



## AUGUST 1996

".....EFFORTS SHOULD BE CONCENTRATED ON DESTROYING, FIGHTING AND KILLING THE [AMERICAN] ENEMY UNTIL, BY THE GRACE OF ALLAH, IT IS COMPLETELY DEFEATED."

FATWA BY OSAMA BIN LADEN TITLED: DECLARATION OF WAR AGAINST THE AMERICAN OCCUPYING THE LAND OF THE TWO HOLY PLACES

## DECEMBER 1998

" ...ACQUIRING (CHEMICAL AND NUCLEAR) WEAPONS FOR THE DEFENSE OF MUSLIMS IS A RELIGIOUS DUTY."

ABC NEWS INTERVIEW WITH OSAMA BIN LADEN







## JUNE 2007

THE ATTACK ON THE GLASGOW INTERNATIONAL AIRPORT IN SCOTLAND USED A CAR WITH PROPANE TANKS. ONE OF THE ATTACKERS WAS AN ENGINEERING STUDENT WORKING TOWARDS A PHD AT ANGLI RUSKIN UNIVERSITY, CAMBRIDGE. ANOTHER ATTACKER WAS A U.K.-BORN DOCTOR WHO WORKED AT THE ROYAL ALEXANDRA HOSPITAL.

THIS DEMONSTRATES THE POSSIBILITY THAT UNIVERSITY AND MEDICAL PROFESSIONALS WITH ACCESS TO NUCLEAR AND RADIOLOGICAL MATERIAL HAVE LINKS TO TERRORIST ORGANIZATIONS AND ACTS.



## OCTOBER 2008

"THE POSSIBILITY OF TERRORISTS OBTAINING NUCLEAR OR OTHER RADIOACTIVE MATERIAL REMAINS A GRAVE THREAT. THE NUMBER OF INCIDENTS REPORTED TO THE IAEA INVOLVING THE THEFT OR LOSS OF NUCLEAR OR RADIOLOGICAL MATERIAL IS DISTURBINGLY HIGH...EQUALLY TROUBLING IS THE FACT THAT MUCH OF THIS MATERIAL IS NOT SUBSEQUENTLY RECOVERED."

DR. MOHAMED ELBARADEI,  
DIRECTOR GENERAL  
INTERNATIONAL ATOMIC  
ENERGY AGENCY



## FEBRUARY 1998

"WE – WITH ALLAH'S HELP – CALL ON EVERY MUSLIM WHO BELIEVES IN ALLAH, AND WISHES TO BE REGARDED TO COMPLY WITH ALLAH'S ORDER TO KILL THE AMERICANS AND PLUNDER THEIR MONEY WHEREVER AND WHENEVER THEY FIND IT.

FATWA BY OSAMA BIN LADEN  
ALSO SIGNED BY AYMAN AL-ZAWAHIR

# THREAT TO GLOBAL SECURITY

WHILE THE GLOBAL WAR ON TERROR HAS DEGRADED AL QAEDA'S CENTRAL COMMAND STRUCTURE, TERRORISTS HAVE EVOLVED. AL QAEDA AND OTHER TERRORIST GROUPS CONTINUE TO CONDUCT ATTACKS. THE JULY 2007 NATIONAL INTELLIGENCE ESTIMATE ON TERRORISM CONCLUDED THAT AL QAEDA CONTINUES TO SEEK THE MATERIALS FOR NUCLEAR AND RADIOLOGICAL WEAPONS AND WOULD NOT HESITATE TO USE THEM. IT INDICATED AL QAEDA CONTINUES TO PLOT TERRORIST ATTACKS AGAINST THE U.S. WITH THE INTENT OF INFLECTING MASS CASUALTIES AND LARGE ECONOMIC LOSSES.

WHILE AL QAEDA CONTINUES TO RECONSTITUTE ITS PRE-9/11 OPERATIONAL CAPABILITIES, IT CONTINUES TO EXPAND ITS ALLIANCES WITH REGIONAL "GUERRILLA" TERRORIST GROUPS WHO ALSO SEEK WEAPONS OF MASS DESTRUCTION.

IN RESPONSE TO THE GLOBAL THREAT, EFFORTS ARE EXPANDING AND ACCELERATING TO PREVENT NUCLEAR AND RADIOLOGICAL MATERIALS FROM FALLING INTO THE HANDS OF TERRORISTS.

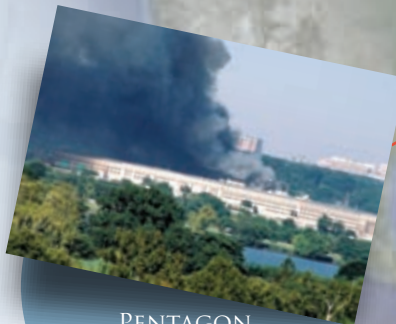
GTRI WORKS WITH INTERNATIONAL PARTNERS TO REDUCE AND PROTECT VULNERABLE NUCLEAR AND RADIOLOGICAL MATERIAL LOCATED AT CIVILIAN SITES WORLDWIDE. GTRI IS A VITAL PART OF THE U.S. STRATEGY TO ADDRESS THE EVOLVING TERRORIST THREATS BY PREVENTING THEIR ACQUISITION OF NUCLEAR AND RADIOLOGICAL MATERIALS.

"LEADERS AROUND THE WORLD MUST ACCELERATE WORK TO LOCK UP OR REMOVE THIS DANGEROUS MATERIAL. WE ARE IN A RACE BETWEEN COOPERATION AND CATASTROPHE."

FORMER SENATOR  
SAM NUNN  
OCTOBER 2008



PENNSYLVANIA  
9/11 ATTACKS,  
SEPTEMBER 2001



PENTAGON  
9/11 ATTACKS,  
SEPTEMBER 2001



NEW YORK CITY  
9/11 ATTACKS,  
SEPTEMBER 2001

# LARGE-SCALE TERRORIST ATTACKS SINCE 2001



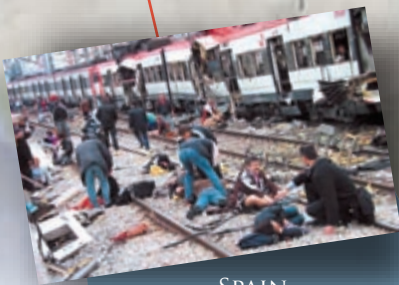
UNITED KINGDOM  
LONDON  
TRANSIT ATTACKS,  
JULY 2005



RUSSIA  
BESLAN SCHOOL  
MASSACRE,  
SEPTEMBER 2004



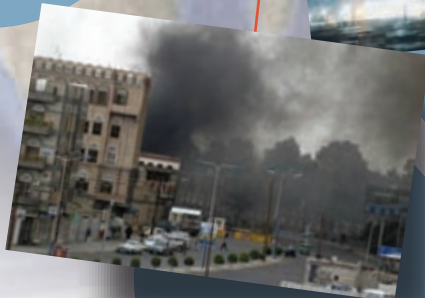
PAKISTAN  
MARRIOTT HOTEL  
BOMBING,  
SEPTEMBER 2008



SPAIN  
MADRID TRAIN  
BOMBINGS,  
MARCH 2004



INDIA  
MUMBAI ATTACKS,  
NOVEMBER 2008



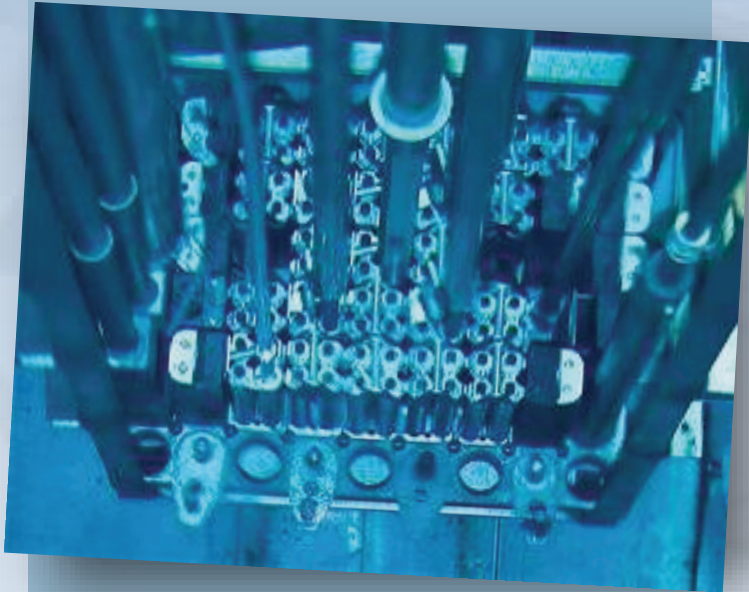
YEMEN  
U.S. EMBASSY ATTACK,  
SEPTEMBER 2008



INDONESIA  
BALI ATTACKS,  
OCTOBER 2002

EACH RED DOT REPRESENTS  
A LARGE-SCALE TERRORIST  
ATTACK SINCE 2001

# GOAL 1 CONVERT



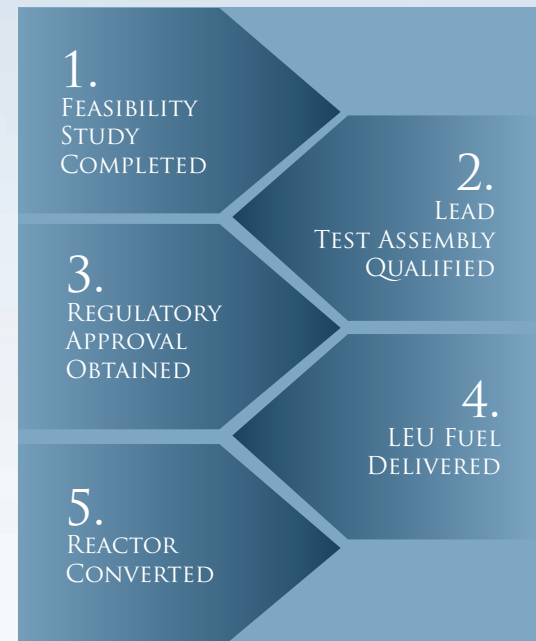
## OBJECTIVE

GTRI'S CONVERT PROGRAM, ALSO KNOWN AS REDUCED ENRICHMENT FOR RESEARCH AND TEST REACTORS (RERTR), SUPPORTS THE CONVERSION OF DOMESTIC AND INTERNATIONAL CIVILIAN RESEARCH REACTORS AND ISOTOPE PRODUCTION FACILITIES FROM HEU TO LEU. THIS INCLUDES WORKING WITH MO-99 PRODUCERS TO CONVERT THEIR OPERATIONS TO LEU TARGETS. THESE EFFORTS RESULT IN PERMANENT THREAT REDUCTION BY MINIMIZING AND, TO THE EXTENT POSSIBLE, ELIMINATING USE OF HEU IN CIVILIAN APPLICATIONS. THE CONVERT PROGRAM IS KEY TO THE GTRI MISSION BECAUSE IT REMOVES THE NEED FOR HEU AT CIVILIAN SITES. ONCE THE NEED IS ELIMINATED, ANY REMAINING HEU FRESH AND SPENT FUEL CAN BE PERMANENTLY DISPOSED OF BY GTRI'S REMOVE PROGRAM.

## CONVERT PROGRAM

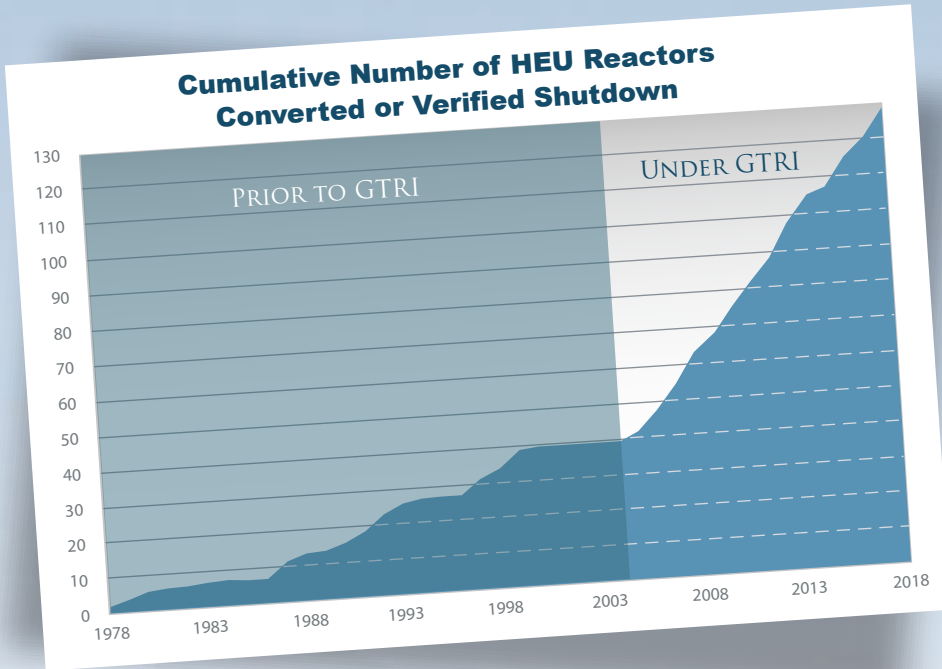
- HEU REACTOR CONVERSION  
- ESTABLISHED 1978

## KEY STEPS



# METRICS

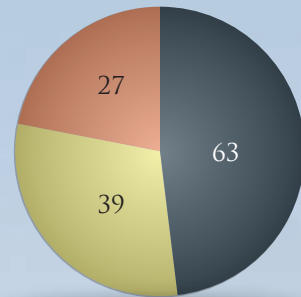
BY 2018, CONVERT OR VERIFY THE SHUTDOWN PRIOR TO CONVERSION OF 129 HEU REACTORS.



IN THE FIRST 4½ YEARS AFTER GTRI WAS ESTABLISHED, THE PROGRAM CONVERTED OR VERIFIED THE SHUTDOWN OF 24 REACTORS. BY COMPARISON, IN THE 4½ YEARS PRIOR TO GTRI'S CREATION ONLY 1 REACTOR WAS CONVERTED.

# REACTORS CONVERTED

(AS OF DECEMBER 2008)



49% COMPLETE

- CONVERTED OR SHUTDOWN PRIOR TO CONVERSION - 63
- PLANNED TO CONVERT WITH EXISTING LEU - 39
- PLANNED TO CONVERT WITH NEW HIGH DENSITY LEU UNDER DEVELOPMENT - 27

TOTAL - 129

THERE ARE AN ADDITIONAL 78 HEU REACTORS CURRENTLY OUTSIDE THE SCOPE OF GTRI BECAUSE THEY ARE USED FOR DEFENSE MISSIONS OR THEY HAVE A UNIQUE DESIGN THAT CANNOT USE LEU FUEL CURRENTLY UNDER DEVELOPMENT.

PREPARING HEU FOR REMOVAL FROM A RESEARCH REACTOR CORE TO ALLOW FOR CONVERSION TO LEU.

# 18 REACTORS CONVERTED SINCE GTRI'S CREATION IN MAY 2004



◀ AUSTRALIA'S HIFAR REACTOR CONVERTED OCT. 2004.

CZECH REPUBLIC'S VR-1 (SPARROW) REACTOR CONVERTED OCT. 2005  
(FIRST RUSSIAN-SUPPLIED RESEARCH REACTOR CONVERSION). ▶



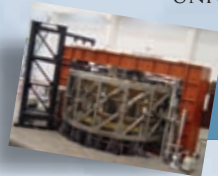
◀ NETHERLANDS' HFR REACTOR AT PETTEN CONVERTED OCT. 2005.

LIBYA'S IRT CRITICAL ASSEMBLY AT TAJOURA CONVERTED JAN. 2006. ▶  
LIBYA'S IRT-1 REACTOR AT TAJOURA CONVERTED OCT. 2006. ▶



◀ TEXAS A&M'S NUCLEAR SCIENCE CENTER 1 MW TRIGA REACTOR CONVERTED SEPT. 2006  
(FIRST U.S. CONVERSION IN SIX YEARS).

UNIVERSITY OF FLORIDA'S 100 KW ARGONAUT-TYPE TRAINING REACTOR CONVERTED SEPT. 2006. ▶



◀ CHINA'S HFETR REACTOR CONVERTED MAR. 2007.  
◀ CHINA'S HFETR CRITICAL ASSEMBLY CONVERTED APR. 2007.

PORTUGAL'S RPI REACTOR CONVERTED SEPT. 2007. ▶



◀ PURDUE UNIVERSITY'S 1 KW POOL REACTOR CONVERTED SEPT. 2007.

VIETNAM'S DALAT REACTOR AT THE NUCLEAR RESEARCH INSTITUTE CONVERTED SEPT. 2007. ▶



◀ UZBEKISTAN'S VVR-SM REACTOR AT THE INSTITUTE OF PHYSICS CONVERTED MAR. 2008.

SOUTH AFRICA'S SAFARI-1 REACTOR CONVERTED SEPT. 2008. ▶



◀ ARGENTINA'S RA-6 REACTOR AT BARILOCHE CONVERTED SEPT. 2008.

WASHINGTON STATE UNIVERSITY'S 1 MW TRIGA REACTOR CONVERTED SEPT. 2008. ▶



◀ OREGON STATE UNIVERSITY'S 1.1 MW TRIGA MARK II REACTOR CONVERTED SEPT. 2008.

UKRAINE'S WWR-M REACTOR AT KIEV INSTITUTE OF NUCLEAR RESEARCH CONVERTED SEPT. 2008. ▶



IN ADDITION, GTRI HAS VERIFIED THE SHUTDOWN OF SIX RESEARCH REACTORS  
GERMANY'S ZLFR MAY 2005, GERMANY'S FRJ-2 MAY 2006, FRANCE'S ULYSSE FEB. 2007,  
CHINA'S MNSR-SH MAR. 2007, UNITED STATES' ZPRR IN IDAHO SEPT. 2008, AND  
UNITED STATES' GENERAL ATOMICS REACTOR IN CALIFORNIA NOV. 2008.

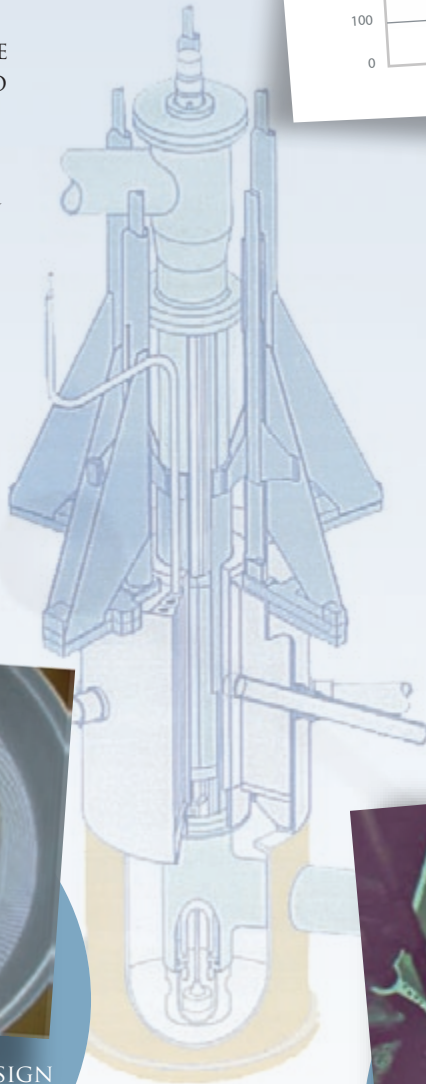
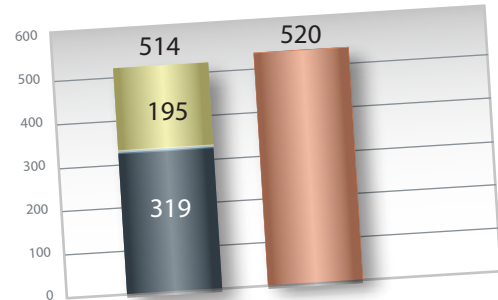
# FUEL FABRICATION CAPABILITY

GTRI IS DEVELOPING A NEW ULTRA-HIGH DENSITY LEU FUEL THAT IS NEEDED TO ENABLE THE CONVERSION OF 27 HIGH PERFORMANCE RESEARCH REACTORS (SIX IN THE UNITED STATES AND 21 INTERNATIONALLY) WITHOUT SIGNIFICANTLY IMPACTING THEIR OPERATIONAL CAPABILITY. THESE 27 HIGH PERFORMANCE REACTORS USE HALF OF ALL CIVILIAN HEU, ABOUT 500 KILOGRAMS PER YEAR (ENOUGH FOR 20 CRUDE NUCLEAR BOMBS).

CURRENT LEU FUELS USED BY GTRI TO CONVERT NON-HIGH PERFORMANCE REACTORS CAN REACH DENSITIES UP TO 4.7 GRAMS/CUBIC CENTIMETER (G/CC). THE NEW ULTRA-HIGH DENSITY MONOLITHIC URANIUM-MOLYBDENUM (U-MO) LEU FUEL BEING DEVELOPED BY GTRI CAN ATTAIN DENSITIES GREATER THAN 16 G/CC.

IN 2007, GTRI ESTABLISHED THE FUEL FABRICATION CAPABILITY (FFC) PROJECT TO WORK WITH INDUSTRY AND THE NATIONAL LABORATORIES TO ACCELERATE EFFORTS TO CREATE A COMMERCIAL SCALE CAPABILITY TO FABRICATE AND SUPPLY THIS NEW ULTRA-HIGH DENSITY U-MO LEU FUEL.

**Kilograms of HEU Avoidance Each Year**



- THE 63 REACTORS CONVERTED OR SHUTDOWN TO DATE RESULT IN 319 KG OF HEU AVOIDANCE EACH YEAR.
- THE 39 REACTORS THAT CAN CONVERT WITH EXISTING LEU WOULD RESULT IN AN ADDITIONAL 195 KG OF HEU AVOIDANCE EACH YEAR.
- THE 27 HIGH PERFORMANCE REACTORS THAT NEED THE NEW HIGH DENSITY LEU TO CONVERT WOULD RESULT IN AN ADDITIONAL 520 KG OF HEU AVOIDANCE EACH YEAR.



THE UNIQUE FUEL ASSEMBLY DESIGN FOR THE HIGH FLUX ISOTOPE REACTOR (HFIR), OAK RIDGE NATIONAL LABORATORY



TOP VIEW OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY REACTOR (MITR-II)

## GOAL 2 REMOVE



### NUCLEAR REMOVE PROGRAMS

- RUSSIAN-ORIGIN  
NUCLEAR MATERIAL REMOVAL  
- ESTABLISHED 2002
- U.S.-ORIGIN  
NUCLEAR MATERIAL REMOVAL  
- ESTABLISHED 1996
- GAP NUCLEAR MATERIAL REMOVAL  
- ESTABLISHED 2005
- EMERGING THREATS  
NUCLEAR MATERIAL REMOVAL  
- ESTABLISHED 2005

### RADIOLOGICAL REMOVE PROGRAMS

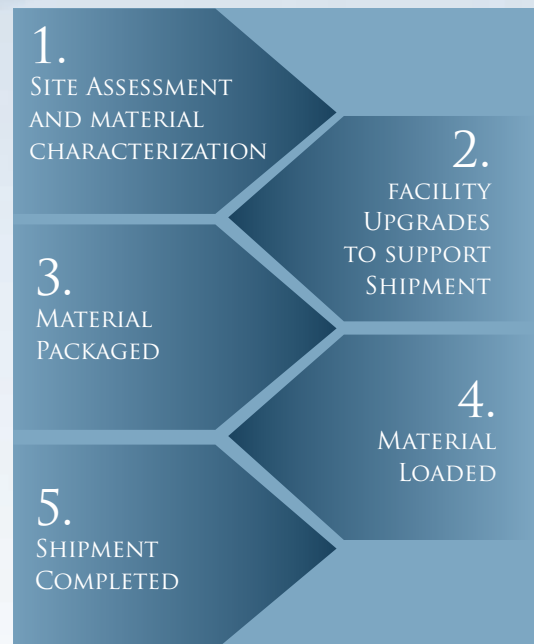
- INTERNATIONAL RADIOLOGICAL  
MATERIAL REMOVAL  
- ESTABLISHED 2003
- DOMESTIC RADIOLOGICAL  
MATERIAL REMOVAL  
- ESTABLISHED 1997

## OBJECTIVE

GTRI'S REMOVE PROGRAM SUPPORTS THE REMOVAL AND DISPOSAL OF EXCESS NUCLEAR AND RADIOLOGICAL MATERIAL FROM CIVILIAN SITES WORLDWIDE. THESE EFFORTS RESULT IN PERMANENT THREAT REDUCTION BY ELIMINATING NUCLEAR AND RADIOLOGICAL MATERIALS THAT TERRORISTS COULD ACQUIRE.

THE REMOVE PROGRAM IS KEY TO THE GTRI MISSION BECAUSE EACH KILOGRAM OR CURIE OF THIS DANGEROUS MATERIAL THAT IS REMOVED REDUCES THE RISK OF A TERRORIST BOMB.

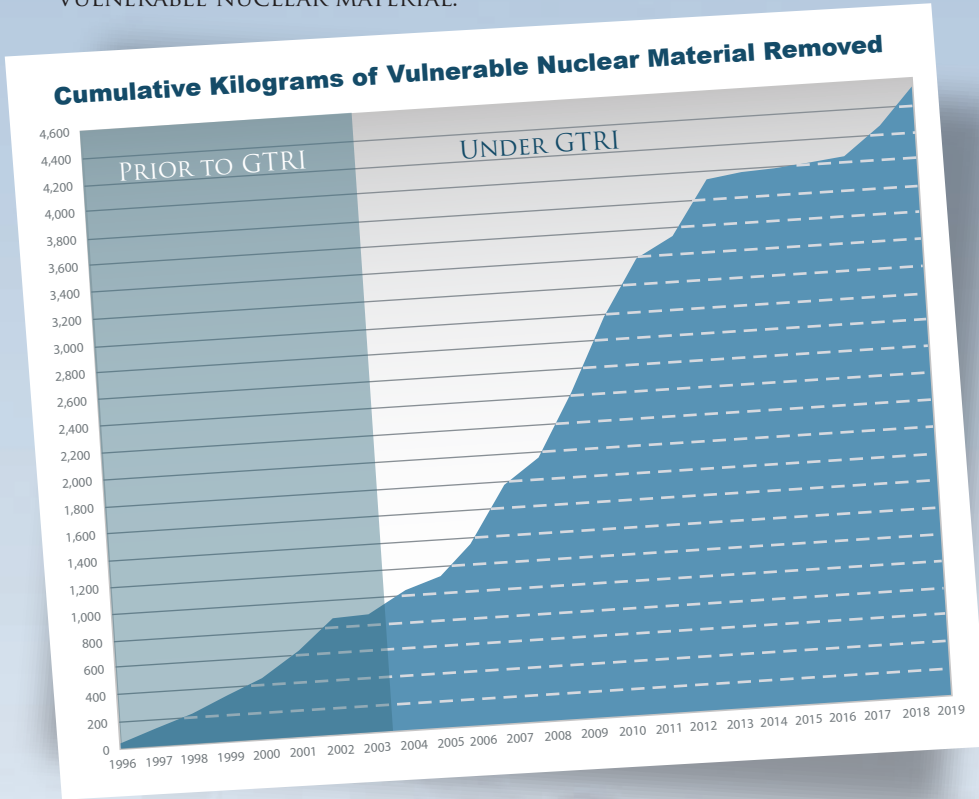
## KEY STEPS



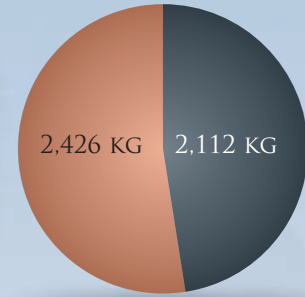


# METRICS

BY 2019, REMOVE OR DISPOSE OF 4,538 KILOGRAMS OF VULNERABLE NUCLEAR MATERIAL.



## NUCLEAR MATERIAL REMOVED (AS OF DECEMBER 2008)



47% COMPLETE

- REMOVED - 2,112 KG
- PLANNED FOR REMOVAL - 2,426 KG

TOTAL - 4,538 KG

IN THE FIRST 4½ YEARS AFTER GTRI WAS ESTABLISHED, THE PROGRAM REMOVED 1,138 KILOGRAMS OF HEU AND PLUTONIUM. BY COMPARISON, IN THE 4½ YEARS PRIOR TO GTRI'S CREATION ONLY 573 KILOGRAMS WERE REMOVED (A DOUBLING IN PACE).



HUNGARIAN HEU LOADING AT THE PORT OF KOPER.

# RUSSIAN-ORIGIN NUCLEAR MATERIAL REMOVAL

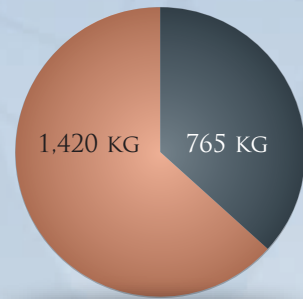
REMOVE OR DISPOSE OF RUSSIAN-ORIGIN NUCLEAR MATERIAL FROM RESEARCH REACTORS WORLDWIDE. ALSO KNOWN AS THE RUSSIAN RESEARCH REACTOR FUEL RETURN (RRFR) PROGRAM.

## METRICS

BY 2017, REMOVE OR DISPOSE OF 2,185 KILOGRAMS OF RUSSIAN-ORIGIN NUCLEAR MATERIAL.

## RUSSIAN-ORIGIN NUCLEAR MATERIAL REMOVED

(AS OF DECEMBER 2008)



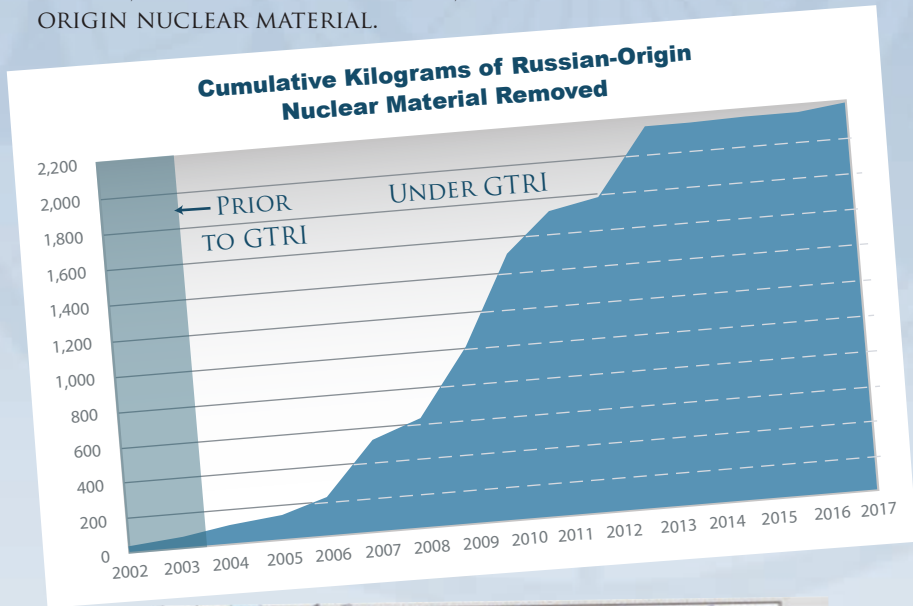
35% COMPLETE

- REMOVED - 765 KG
- PLANNED FOR REMOVAL - 1,420 KG

TOTAL - 2,185 KG

GTRI HAS REMOVED ALL RUSSIAN-ORIGIN HEU FROM 2 COUNTRIES.

- BULGARIA
- LATVIA



CASKS BEING READIED FOR SHIPMENT FROM BULGARIA, JULY 2008



LOADING FRESH HEU ONTO THE PLANE AT RIGA AIRPORT FOR TRANSPORT FROM LATVIA TO RUSSIA, MAY 2008

# U.S.-ORIGIN NUCLEAR MATERIAL REMOVAL

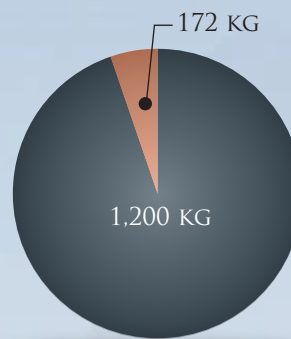
REMOVE OR DISPOSE OF U.S.-ORIGIN HEU AND LEU FROM TRIGA AND MTR RESEARCH REACTORS. ALSO KNOWN AS THE U.S. FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL (FRRSNF) PROGRAM. LEU WILL BE RETURNED TO THE UNITED STATES UNTIL 2019.

## METRICS

BY 2013, REMOVE OR DISPOSE OF 1,372 KILOGRAMS OF U.S.-ORIGIN HEU.

## U.S.-ORIGIN NUCLEAR MATERIAL REMOVED

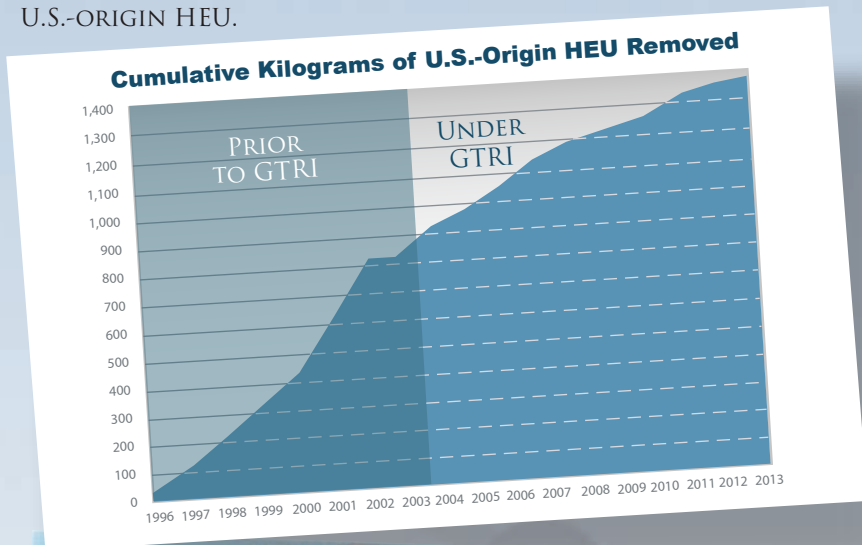
(AS OF DECEMBER 2008)



87% COMPLETE

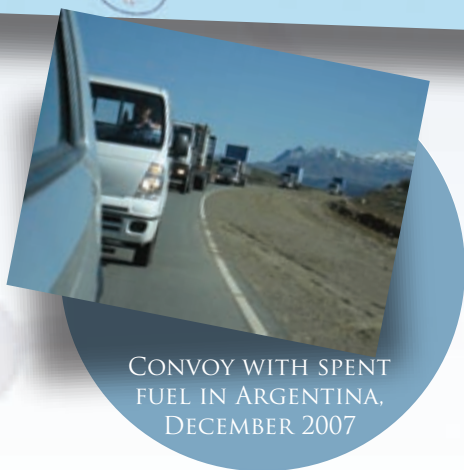
- REMOVED - 1,200 KGS
- PLANNED FOR REMOVAL - 172 KGS

TOTAL - 1,372 KGS



ALL ELIGIBLE U.S.-ORIGIN HEU HAS BEEN REMOVED FROM FROM 16 COUNTRIES

- |  |           |  |             |
|--|-----------|--|-------------|
|  | ARGENTINA |  | PHILIPPINES |
|  | BRAZIL    |  | PORTUGAL    |
|  | CHILE     |  | ROMANIA     |
|  | COLOMBIA  |  | SLOVENIA    |
|  | DENMARK   |  | SOUTH KOREA |
|  | GERMANY   |  | SPAIN       |
|  | GREECE    |  | SWEDEN      |
|  | ITALY     |  | THAILAND    |



CONVOY WITH SPENT FUEL IN ARGENTINA, DECEMBER 2007



UNLOADING SPENT FUEL IN THE UNITED STATES, APRIL 2007

# GAP NUCLEAR MATERIAL REMOVAL

REMOVE OR DISPOSE OF VULNERABLE, HIGH RISK NUCLEAR MATERIALS THAT ARE NOT COVERED UNDER THE RUSSIAN-ORIGIN AND U.S.-ORIGIN NUCLEAR MATERIAL REMOVAL PROGRAMS. THIS INCLUDES U.S.-ORIGIN HEU OTHER THAN TRIGA AND MTR FUELS, HEU OF NON-U.S. AND NON-RUSSIAN-ORIGIN, AND WEAPONS-USABLE SEPARATED PLUTONIUM.

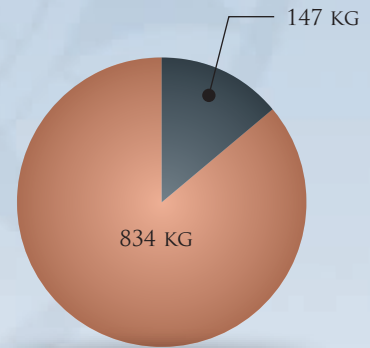
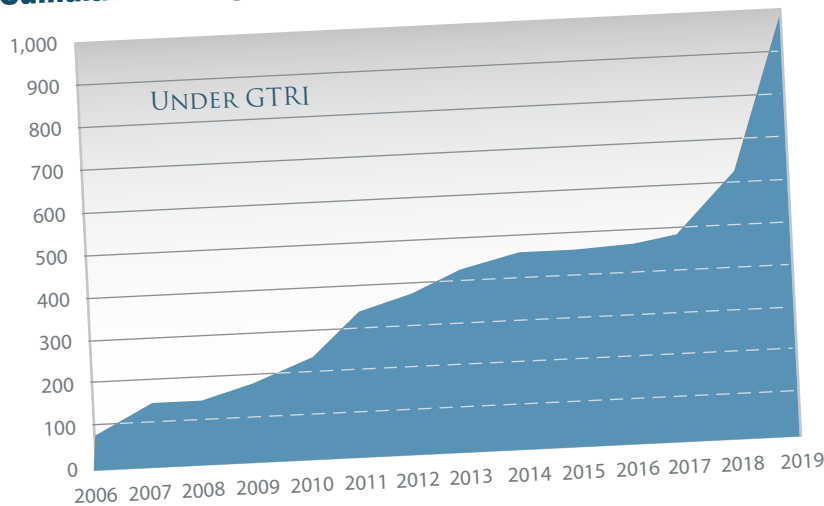
## METRICS

BY 2019, REMOVE OR DISPOSE OF 981 KILOGRAMS OF GAP NUCLEAR MATERIAL.

## GAP NUCLEAR MATERIAL REMOVED

(AS OF DECEMBER 2008)

**Cumulative Kilograms of Gap Nuclear Material Removed**



15% COMPLETE

● REMOVED - 147 KG

● PLANNED FOR REMOVAL - 834 KG

TOTAL - 981 KG

# EMERGING THREATS NUCLEAR MATERIAL REMOVAL

DEVELOP THE CAPABILITY TO RAPIDLY DENUCLEARIZE A COUNTRY ENSURING THAT WHEN OPPORTUNITIES PRESENT THEMSELVES, SUCH AS LIBYA IN 2004, THE U.S. IS ABLE TO RESPOND QUICKLY. THIS INCLUDES IN-COUNTRY STABILIZATION, PACKAGING, AND REMOVAL OF NUCLEAR MATERIALS THROUGH THE DEPLOYMENT OF SELF-SUFFICIENT, TRAINED RAPID RESPONSE TEAMS.



MOBILE GLOVEBOX FOR PLUTONIUM HANDLING

# DPRK DENUCLEARIZATION

THE SEPTEMBER 2005 JOINT STATEMENT CALLS FOR THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK) TO ABANDON "ALL NUCLEAR WEAPONS AND EXISTING NUCLEAR PROGRAMS." GTRI SUPPORTS THE SIX PARTY TALKS AND DENUCLEARIZATION ACTIVITIES ALONG WITH OTHER OFFICES IN NNSA, THE U.S. INTERAGENCY, AND THE OTHER FIVE PARTIES (RUSSIA, CHINA, JAPAN, SOUTH KOREA, AND DPRK).

GTRI PROVIDES FINANCIAL SUPPORT AND PERSONNEL TO MAINTAIN THE WATER CHEMISTRY OF THE FUEL POND IN YONGBYON AND PARTICIPATES IN THE OVERSIGHT OF DISABLEMENT ACTIVITIES. GTRI PROVIDES PLANNING SUPPORT AND TECHNICAL ADVICE TO THE INTERAGENCY AND WOULD BE THE TECHNICAL LEAD FOR ANY POTENTIAL MATERIAL REMOVAL ACTIVITIES.



## INTERNATIONAL CONTRIBUTIONS

SECTION 3113 OF THE JOHN WARNER NATIONAL DEFENSE AUTHORIZATION ACT FOR 2007 ALLOWS GTRI TO ACCEPT FINANCIAL CONTRIBUTIONS FOR GLOBAL THREAT REDUCTION EFFORTS. GTRI'S DEMONSTRATED TRACK RECORD OF ACHIEVING MEANINGFUL AND MEASURABLE THREAT REDUCTION RESULTS ALONG WITH ITS SOUND PROJECT MANAGEMENT REPUTATION HAS RESULTED IN APPROXIMATELY \$13 MILLION IN INTERNATIONAL CONTRIBUTIONS IN THE FIRST TWO YEARS.

BENEFITS OF CONTRIBUTING TO GTRI INCLUDE:

- THE CONTRIBUTOR DOES NOT HAVE THE BURDEN OF NEGOTIATING AGREEMENTS WITH MULTIPLE RECIPIENT COUNTRIES/ORGANIZATIONS.
- QUICKER IMPLEMENTATION BY USING GTRI'S EXISTING AGREEMENTS AND RELATIONSHIPS, SAVING TIME AND MONEY.
- MAXIMIZES THE CONTRIBUTOR'S ABILITY TO SPEND FUNDS ON PROJECT IMPLEMENTATION RATHER THAN ON MANAGEMENT AND ADMINISTRATION.
- ENSURES THAT THE CONTRIBUTOR WILL RECEIVE FULL CREDIT FOR PROJECTS AND MONTHLY REPORTS DETAILING PROGRESS.

INTERNATIONAL CONTRIBUTIONS  
TOTAL TO DATE \$12,950,000



CANADA  
\$8,700,000



UNITED KINGDOM  
\$4,000,000



SOUTH KOREA  
\$250,000

# INTERNATIONAL RADIOLOGICAL MATERIAL REMOVAL

REMOVE OR DISPOSE OF EXCESS OR ABANDONED RADIOLOGICAL MATERIALS IN OTHER COUNTRIES. THIS INCLUDES RUSSIAN RADIOISOTOPIC THERMOELECTRIC GENERATORS (RTGs), U.S.-ORIGIN SEALED SOURCES IN OTHER COUNTRIES, AND OTHER ORPHANED RADIOLOGICAL MATERIALS.

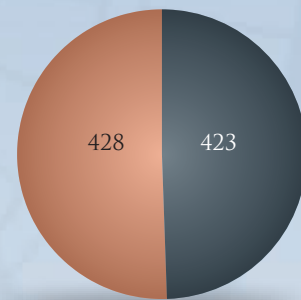
## METRICS

BY 2018, REMOVE OR DISPOSE OF 851 RTGS LOCATED IN RUSSIA.

## RUSSIAN RTGS

### REMOVED

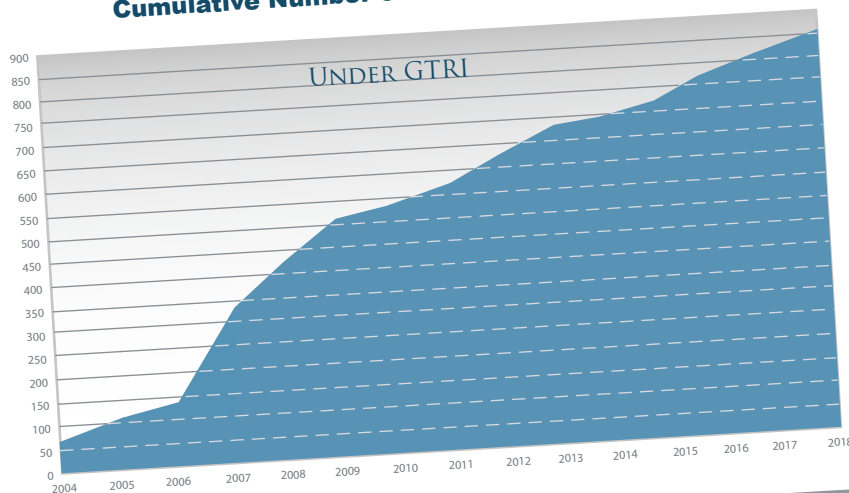
(AS OF DECEMBER 2008)



50% COMPLETE

- RTGS REMOVED - 423
- RTGS PLANNED FOR REMOVAL - 428
- TOTAL - 851 RTGS

**Cumulative Number of Russian RTGs Removed**



IN ACCORDANCE WITH THE INTERNATIONAL RTG WORKING GROUP'S RTG ACTION PLAN, THE RECOVERY OF ALL REMAINING RUSSIAN RTGS COULD BE COMPLETED BY 2013 IF ADDITIONAL INTERNATIONAL CONTRIBUTIONS CAN BE IDENTIFIED.

GTRI COORDINATES RTG EFFORTS WITH



UNSECURE RUSSIAN RTGS,  
MARCH 2006



SAFETY CHECK ON A DAMAGED  
UNSECURE RTG,  
SEPTEMBER 2005

# DOMESTIC RADIOLOGICAL MATERIAL REMOVAL

REMOVE AND DISPOSE OF DOMESTIC RADIOLOGICAL MATERIALS BY WORKING IN COOPERATION WITH FEDERAL, STATE, AND LOCAL AGENCIES, AND PRIVATE INDUSTRY TO RECOVER AND PERMANENTLY DISPOSE OF EXCESS RADIOLOGICAL SOURCES IN THE UNITED STATES.

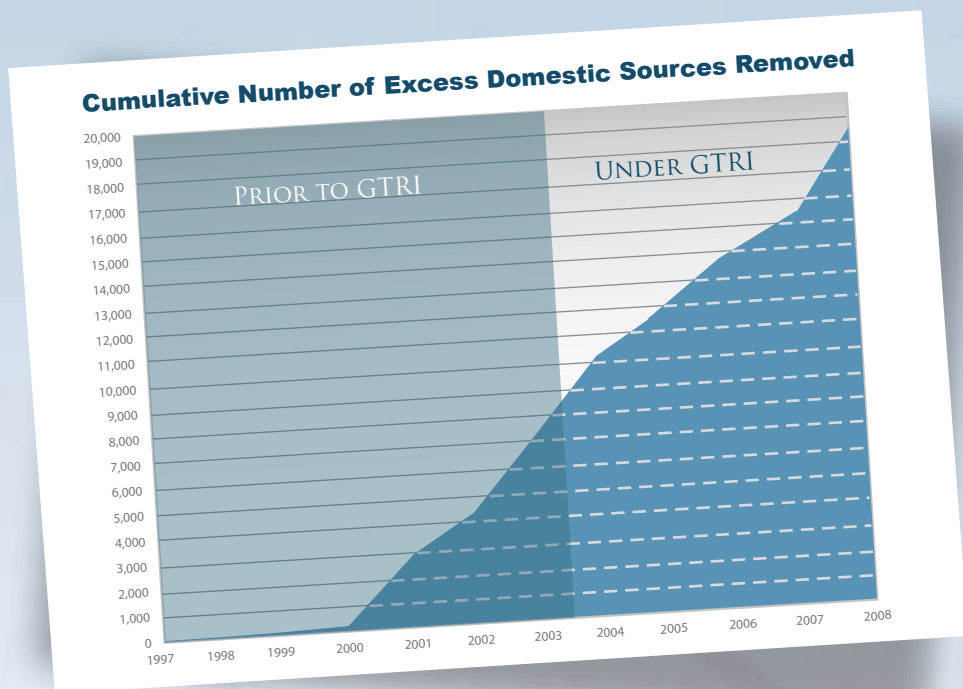
## METRICS

ANNUALLY, REMOVE AT LEAST 2,500 EXCESS DOMESTIC RADIOLOGICAL SOURCES.

## DOMESTIC RADIOLOGICAL SOURCES REMOVED (AS OF DECEMBER 2008)

A CUMULATIVE TOTAL OF 20,312 DOMESTIC SOURCES HAVE BEEN RECOVERED. THESE SOURCES TOTAL APPROXIMATELY 720,000 CURIES, ENOUGH FOR 720 LARGE RADIOLOGICAL DIRTY BOMBS.

EACH YEAR OVER 3,000 NEW SOURCES ARE REGISTERED AS EXCESS, CREATING A BACKLOG OF MORE THAN 8,000 SOURCES.

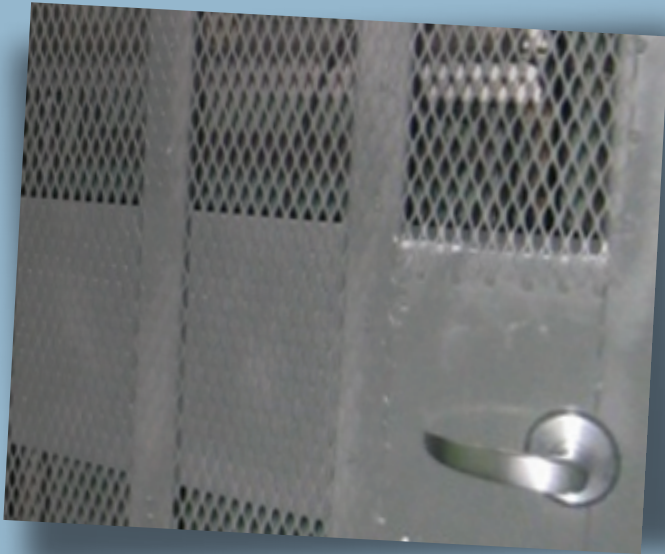


RECOVERED AMERICIUM FROM RETIRED WELL LOGGER, OKLAHOMA 1996



DISSUSED RADIATION SOURCES, TEXAS 2005

## GOAL 3 PROTECT



## OBJECTIVE

GTRI'S PROTECT PROGRAM SUPPORTS THE SECURING OF HIGH PRIORITY NUCLEAR AND RADIOLOGICAL MATERIAL WORLDWIDE FROM THEFT AND SABOTAGE. THESE EFFORTS RESULT IN THREAT REDUCTION BY IMPROVING SECURITY ON THE BOMB MATERIAL REMAINING AT CIVILIAN SITES. THE PROTECT PROGRAM IS KEY TO THE GTRI MISSION BECAUSE IT UPGRADES SECURITY UNTIL A PERMANENT THREAT REDUCTION SOLUTION CAN BE IMPLEMENTED.

## PROTECT PROGRAMS

- DOMESTIC MATERIAL PROTECTION  
- ESTABLISHED 2007
- INTERNATIONAL MATERIAL PROTECTION  
- ESTABLISHED 2000
- BN-350 NUCLEAR MATERIAL PROTECTION  
- ESTABLISHED 1996

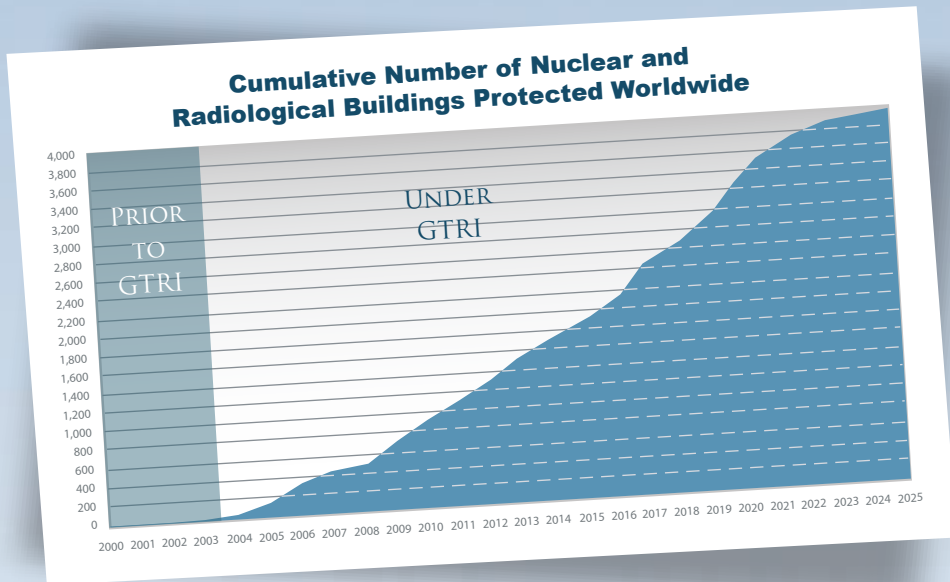
## KEY STEPS



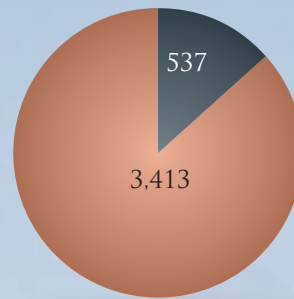


# METRICS

BY 2025, PROTECT AN ESTIMATED 3,950 HIGH PRIORITY NUCLEAR AND RADIOLOGICAL BUILDINGS WORLDWIDE.



## BUILDINGS PROTECTED (AS OF DECEMBER 2008)



14% COMPLETE

- BUILDINGS PROTECTED - 537
- BUILDINGS PLANNED FOR PROTECTION - 3,413
- TOTAL - 3,950

A BUILDING IS DEFINED AS ANY RESEARCH REACTOR OR FACILITY WITH RADIOLOGICAL MATERIAL OF CONCERN, BOTH DOMESTIC AND INTERNATIONAL.

PHYSICAL ACCESS CONTROL

IN THE FIRST 4½ YEARS AFTER GTRI WAS ESTABLISHED THE PROGRAM PROTECTED 504 BUILDINGS. BY COMPARISON, IN THE 4½ YEARS PRIOR TO GTRI'S CREATION 33 BUILDINGS WERE PROTECTED.

# DOMESTIC MATERIAL PROTECTION

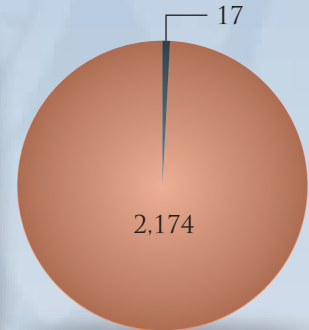
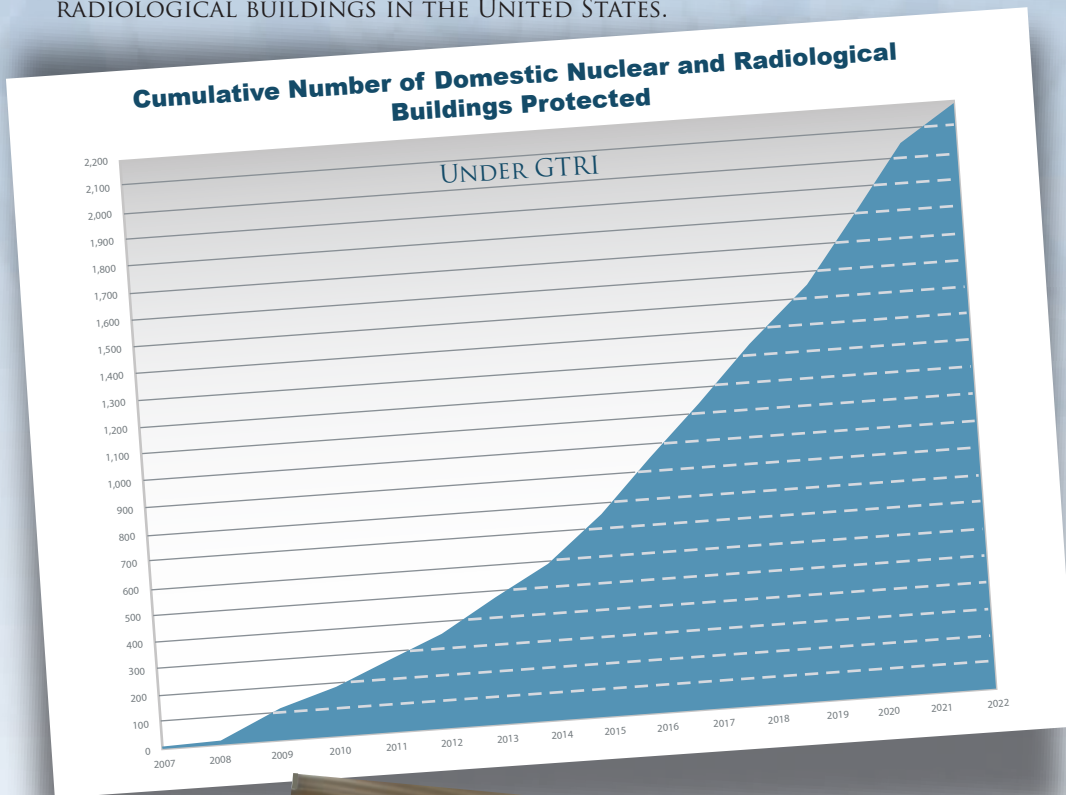
WORK IN COOPERATION WITH FEDERAL, STATE, AND LOCAL AGENCIES, AND PRIVATE INDUSTRY TO INSTALL SECURITY UPGRADES ON HIGH-PRIORITY NUCLEAR AND RADIOLOGICAL MATERIALS LOCATED AT CIVILIAN SITES IN THE UNITED STATES.

## METRICS

BY 2022, PROTECT AN ESTIMATED 2,191 HIGH PRIORITY NUCLEAR AND RADIOLOGICAL BUILDINGS IN THE UNITED STATES.

### DOMESTIC BUILDINGS PROTECTED

(AS OF DECEMBER 2008)

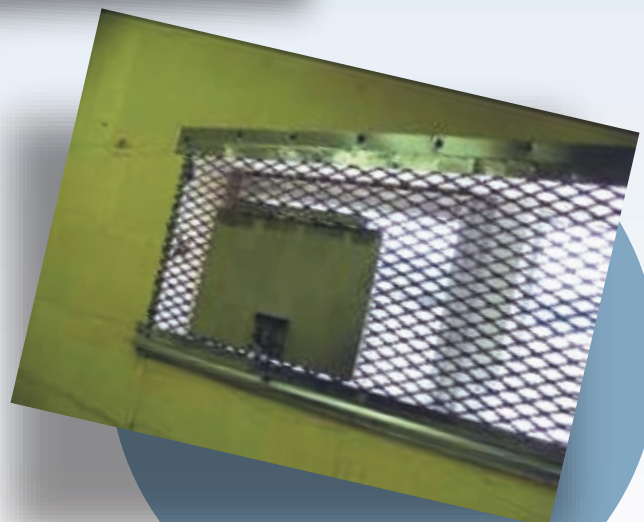


1% COMPLETE

- BUILDINGS PROTECTED - 17
- BUILDINGS PLANNED FOR PROTECTION - 2,174
- TOTAL - 2,191

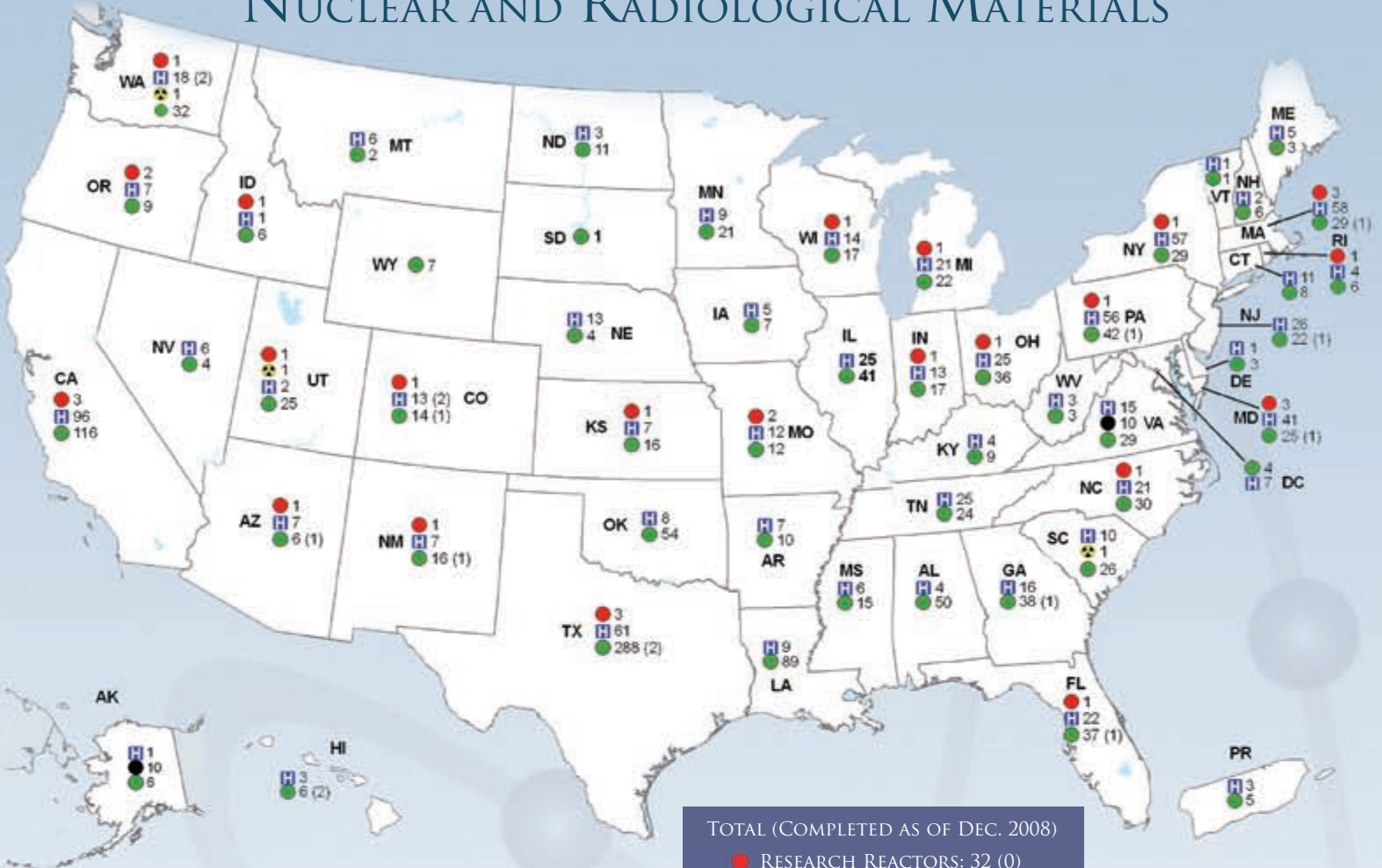


MONITORING SYSTEM



GRATED WINDOW

# U.S. BUILDINGS WITH HIGH-PRIORITY NUCLEAR AND RADIOLOGICAL MATERIALS



RETINAL SCANNER  
TO CONTROL  
ACCESS



RESPONSE FORCE  
PERSONAL RADIATION  
DETECTOR

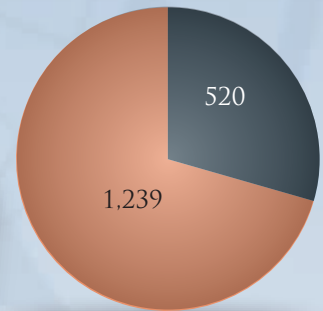
# INTERNATIONAL MATERIAL PROTECTION

WORK IN COOPERATION WITH FOREIGN COUNTERPARTS AND INTERNATIONAL AGENCIES TO INSTALL SECURITY UPGRADES ON HIGH-PRIORITY, VULNERABLE NUCLEAR AND RADIOLOGICAL MATERIALS LOCATED AT CIVILIAN SITES OUTSIDE THE UNITED STATES.

## METRICS

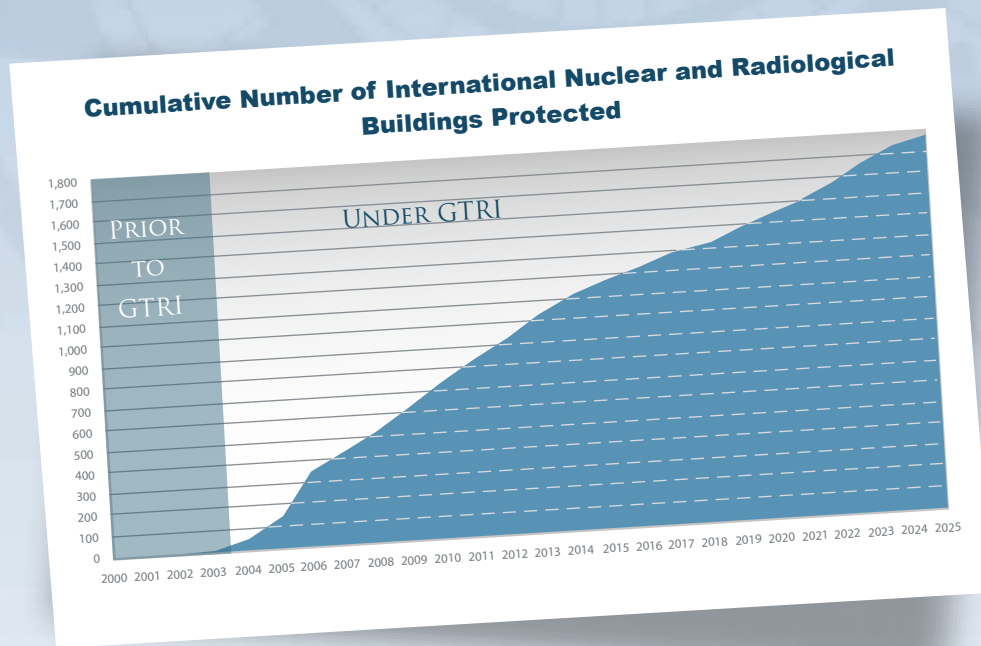
BY 2025, PROTECT AN ESTIMATED 1,759 HIGH PRIORITY NUCLEAR AND RADIOLOGICAL BUILDINGS LOCATED INTERNATIONALLY.

## INTERNATIONAL BUILDINGS PROTECTED (AS OF DECEMBER 2008)



30% COMPLETE

- BUILDINGS PROTECTED - 520
  - BUILDINGS PLANNED FOR PROTECTION - 1,239
- TOTAL - 1,759



MATERIAL VAULTS



HARDENED WINDOWS

# BN-350 NUCLEAR MATERIAL PROTECTION

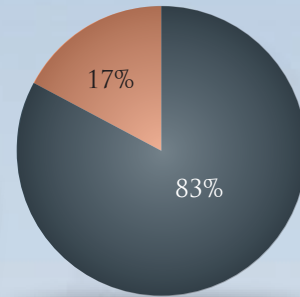
PROVIDE SAFE AND SECURE LONG TERM STORAGE FOR APPROXIMATELY 3,000 KILOGRAMS OF WEAPONS-GRADE PLUTONIUM AND 10,000 KILOGRAMS OF HEU IN SPENT FUEL FROM THE SHUTDOWN BN-350 FAST BREEDER REACTOR IN KAZAKHSTAN.

## METRICS

BY 2010, COMPLETE 100% OF BN-350 PROTECTION EFFORTS.

## BN-350 PROTECTION EFFORTS COMPLETED

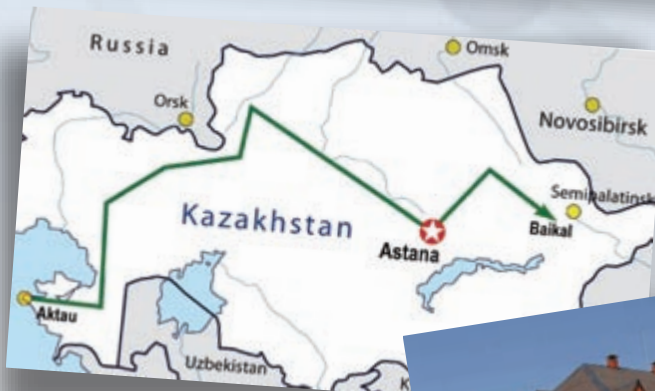
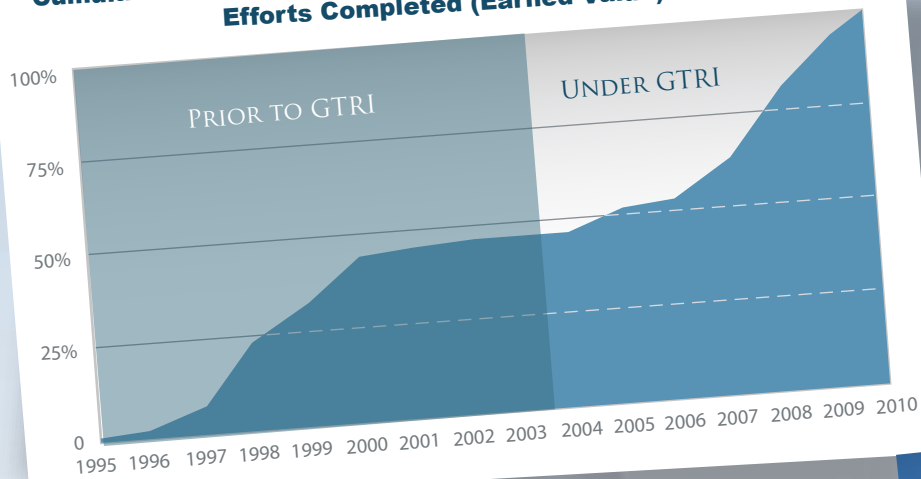
(AS OF DECEMBER 2008)



83% COMPLETE

- PERCENT COMPLETE - 83%
- PERCENT YET TO COMPLETE - 17%
- TOTAL - 100%

**Cumulative Percentage of BN-350 Nuclear Material Protection Efforts Completed (Earned Value)**



CASK HANDLING EQUIPMENT AT WORK AT AKTAU



CASKS IN TRANSPORT

# PROJECT MANAGEMENT

GTRI IS COMMITTED TO A PROJECT MANAGEMENT CULTURE THAT ENSURES EFFECTIVE PLANNING, EXECUTION, AND ACHIEVEMENT OF MEASURABLE RESULTS IN ACCORDANCE WITH THE GTRI MISSION. GTRI PROJECT MANAGEMENT GOALS ARE BASED ON SOUND PRINCIPLES INCLUDING:

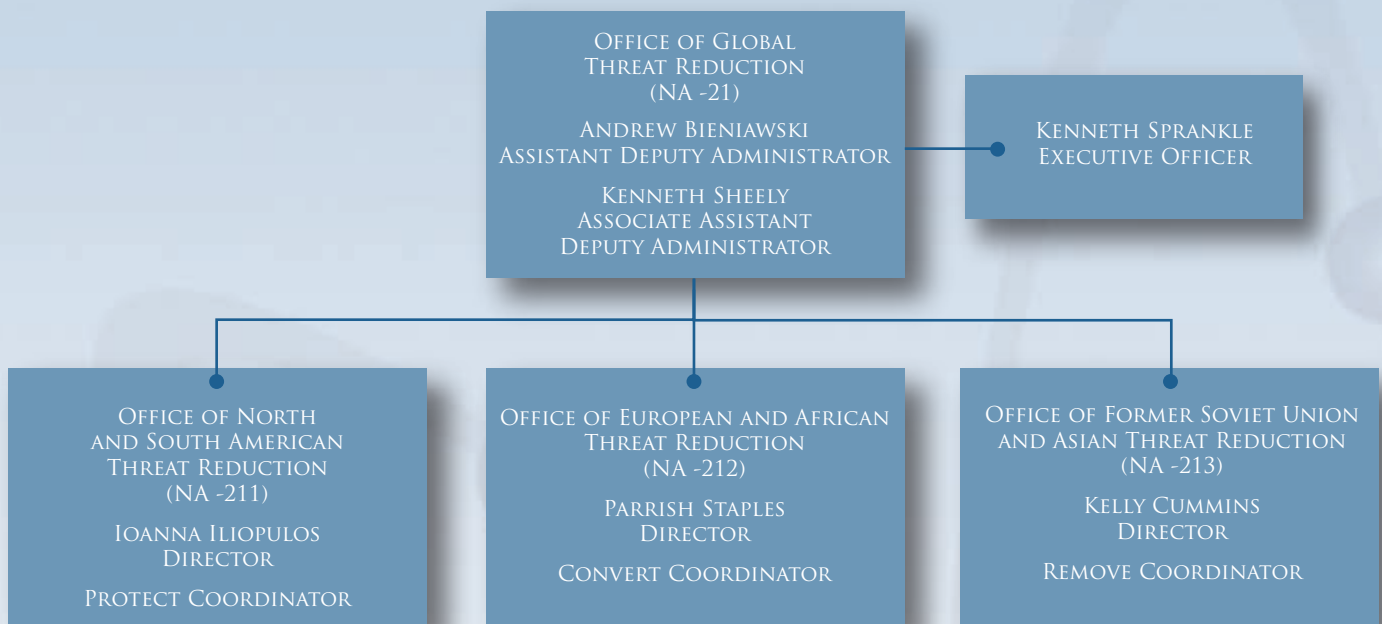
- CLEAR, MEANINGFUL, AND MEASURABLE GOALS, PRIORITIES, AND PERFORMANCE MEASURES TO ANALYZE AND ARTICULATE THE EVOLVING THREAT AND THE EFFECTIVENESS OF THE GTRI RESPONSE.
- COST-EFFECTIVE USE OF INFORMATION TECHNOLOGY TO MANAGE SCOPE, SCHEDULE, AND COST.
- AN ORGANIZATIONAL STRUCTURE THAT EMPOWERS PEOPLE TO ACHIEVE RESULTS, ENFORCES ACCOUNTABILITY, AND DEVELOPS A CADRE OF TALENTED PEOPLE.
- STRENGTHENED CUSTOMER SERVICE TO ENSURE PRODUCTS AND SERVICES ARE DELIVERED ON TIME, WITHIN COST, AND IN ACCORDANCE WITH OUR COMMITMENTS.



GTRI'S WEB-BASED G2 PROJECT MANAGEMENT SYSTEM USES BEST-IN-CLASS BUSINESS PRACTICES TO MANAGE SCOPE, SCHEDULE, AND COST.

# ORGANIZATION

GTRI'S ORGANIZATIONAL STRUCTURE FACILITATES IMPLEMENTATION OF THE PROGRAM'S GOALS, EMPOWERS PEOPLE TO ACHIEVE RESULTS, ENFORCES ACCOUNTABILITY FOR PERFORMANCE, AND DEVELOPS A CADRE OF TALENTED PEOPLE.



THE CHART ABOVE REPRESENTS THE GTRI LEADERSHIP, HOWEVER, THERE ARE OVER 40 DEDICATED EMPLOYEES AT HEADQUARTERS AS WELL AS NUMEROUS TECHNICAL EXPERTS AND INTERNATIONAL PARTNERS THAT IMPLEMENT THE GTRI PROGRAM.

PREPARED BY  
OFFICE OF GLOBAL THREAT REDUCTION  
955 L'ENFANT PLAZA  
WASHINGTON, DC 20585

WWW.NNSA.DOE.GOV  
(202) 586-9215



U.S. DEPARTMENT OF  
**ENERGY**

