

The background of the cover is a photograph of the IAEA headquarters building in Vienna, Austria, which is a large, curved, modern structure with many windows. In the foreground, there are numerous flagpoles, each flying a different national flag. The sky is a clear, bright blue. The overall image has a slight cyan/blue tint.

IAEA ANNUAL REPORT 2012
Additional Annex Information

IAEA ANNUAL REPORT 2012

Additional Annex Information

Table A16. Coordinated research projects initiated in 2012

Nuclear Power

- Benchmark analysis of an EBR-II shutdown heat removal test
- Examining the techno-economics of nuclear hydrogen production and benchmark analysis of the IAEA HEEP software
- HTGR reactor physics, thermal-hydraulics and depletion uncertainty analysis
- Prediction of axial and radial creep in pressure tubes

Nuclear Fuel Cycle and Materials Technologies

- Demonstrating the performance of spent fuel and related storage system components during very long term storage
- Near term and promising long term options for the deployment of thorium based nuclear energy

Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

- Techno-economic evaluation of options for adapting nuclear and other energy infrastructure to long-term climate change and extreme weather

Nuclear Science

- Applications of synchrotron radiation for environmental sciences and materials research for development of environmentally friendly resources
- Conceptual development of steady state compact fusion neutron sources
- Development of an integrated approach to routine automation of neutron activation analysis
- Improved instrumentation and control (I&C) maintenance techniques for research reactors using the plant computer
- Nuclear data for charged particle monitor reactions and medical isotope production
- Utilization of accelerator based real time methods in the investigation of materials with high technological importance

Food and Agriculture

- Integrated utilization of cereal mutant varieties in crop/livestock production systems for climate smart agriculture
- Use of stable isotopes to trace bird migrations and molecular nuclear techniques to investigate the epidemiology and ecology of the highly pathogenic avian influenza
- Use of symbiotic bacteria to reduce mass rearing costs and increase mating success in selected fruit pests in support of sterile insect technique applications

Human Health

- Strengthening of 'biological dosimetry' in IAEA Member States: Improvement of current techniques and intensification of collaboration and networking among the different institutes.

Water Resources

- Environmental isotope and age dating methods to assess water quality in rivers affected by shallow groundwater discharges
- Use of environmental isotopes to assess sustainability of intensively exploited aquifer systems

Environment

- Ocean acidification and the economic impact on fisheries and coastal society

Radioisotope Production and Radiation Technology

- Application of two and three dimensional neutron imaging with focus on cultural heritage research
- Radiometric methods for measuring and modelling multiphase systems towards process management

Management of Radioactive Waste

- Processing technologies for high level waste, formulation of matrices and characterization of waste forms

Table A17. Coordinated research projects completed in 2012

Nuclear Power

- Benchmark analyses of sodium natural convection in the upper plenum of the MONJU reactor vessel
- New technologies for seawater desalination using nuclear energy
- Systems, structures, and components in nuclear power plants

Nuclear Fuel Cycle and Materials Technologies

- Improvement of computer codes used for fuel behaviour simulation FUMEX-III

Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

- Techno-economic comparison of ultimate disposal facilities for CO₂ and nuclear waste

Nuclear Science

- Accelerator simulation and theoretical modelling of radiation effects (SMoRE)
- Advanced surveillance, diagnostics, and prognostics techniques used for health monitoring of systems and structures
- Developing techniques for small scale indigenous molybdenum-99 production using low enriched uranium (LEU) fission or neutron activation
- Improved production and utilization of short pulsed, cold neutrons at low-medium energy spallation neutron sources
- Improvement of the reliability and accuracy of heavy ion beam nuclear analytical techniques
- Minor actinide neutron reaction data (MANREAD)
- Updated decay data library for actinides

Food and Agriculture

- Early and rapid diagnosis of emerging diseases (focus on avian influenza)
- Improving SIT for tsetse flies through research on their symbionts and pathogens
- Managing irrigation water to enhance crop productivity under water-limiting conditions: A role for isotopic techniques
- Selection and evaluation of food (cereal and legume) crop genotypes tolerant to low nitrogen and phosphorus soils through the use of isotopic and nuclear-related techniques

Human Health

- Application of FDG-PET and molecular gene profiling for risk stratification of diffuse large B-cell Non-Hodgkin's lymphoma in different ethnic populations
- Assessment of left ventricular function in coronary artery disease with nuclear techniques
- Improving outcomes in radiotherapy using novel biotechnologies: Modification of tissue reactions and the use of stem cell therapeutics
- Nutrition and HIV/AIDS: The efficacy of food based interventions evaluated by stable isotope techniques
- Performance of rest myocardial perfusion imaging in the management of acute chest pain in the emergency room

Water Resources

- Geostatistical analysis of spatial isotope variability to map the sources of water for hydrology studies
- Isotopic techniques for assessment of hydrological processes in wetlands

Environment

- Applications of radiotracer and radioassay technologies to seafood safety assessment

Radioisotope Production and Radiation Technology

- Development of radiopharmaceuticals based on ^{188}Re and ^{90}Y for radionuclide therapy evaluation of the biological safety and clinical efficacy of ^{177}Lu -EDTMP for bone pain palliation in metastatic prostate cancer (Phase I/II Clinical Trial)

Safety of Nuclear Installations

- Modelling and analysis of radionuclides transport and source term evaluation within containment/confinement and release to the environment, for research reactors

Nuclear Security

- Application of nuclear forensics in illicit trafficking of nuclear and other radioactive materials development of methodology for risk assessment and state management of nuclear security regime
- Development and implementation of instruments and methods for detection of unauthorized acts involving nuclear and other radioactive material
- Planning, management and organizational aspects in decommissioning of nuclear facilities

Table A18. Publications issued in 2012**Nuclear Power**

- Advances in Nuclear Power Process Heat Applications — IAEA TECDOC Series No. 1682
- Assessing and Managing Cable Ageing in Nuclear Power Plants — IAEA Nuclear Energy Series No. NP-T-3.6
- Comparison of Heavy Water Reactor Thermohydraulic Code Predictions with Small Break LOCA Experimental Data — IAEA TECDOC Series No. 1688
- Country Nuclear Power Profiles — 2012 Edition
- Electric Grid Reliability and Interface with Nuclear Power Plants — IAEA Nuclear Energy Series No. NG-T-3.8
- Fast Reactors and Related Fuel Cycles: Challenges and Opportunities (FR09): Proceedings of an International Conference Held in Kyoto, Japan, 7–11 December 2009 — Proceedings Series
- Invitation and Evaluation of Bids for Nuclear Power Plants — IAEA Nuclear Energy Series No. NG-T-3.9
- Liquid Metal Coolants for Fast Reactors (Reactors Cooled by Sodium, Lead and Lead-bismuth Eutectic) — IAEA Nuclear Energy Series No. NP-T-1.6
- Management System Standards: Comparison between IAEA GS-R-3 and ASME NQA-1-2008 and NQA-1a-2009 Addenda — Safety Reports Series No. 70
- Management System Standards: Comparison between IAEA GS-R-3 and ISO 9001:2008 — Safety Reports Series No. 69
- Managing Siting Activities for Nuclear Power Plants — IAEA Nuclear Energy Series No. NG-T-3.7
- Modelling of Transport of Radioactive Substances in the Primary Circuit of Water Cooled Reactors — IAEA TECDOC Series No. 1672
- Natural Circulation Phenomena and Modelling for Advanced Water Cooled Reactors — IAEA TECDOC Series No. 1677
- Nuclear Power Reactors in the World, 2012 Edition — Reference Data Series No. 2
- Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities — IAEA Nuclear Energy Series No. NW-G-2.1
- Project Management in Nuclear Power Plant Construction: Guidelines and Experience — IAEA Nuclear Energy Series No. NP-T-2.7

Nuclear Fuel Cycle and Materials Technologies

- Advances in High Temperature Gas Cooled Reactor Fuel Technology — IAEA TECDOC Series No. 1674
- Assessment of Nuclear Energy Systems Based on a Closed Fuel Cycle with Fast Reactors — IAEA TECDOC Series No. 1639/Rev.1
- Experiences and Trends of Manufacturing Technology of Advanced Nuclear Fuels — IAEA TECDOC Series No. 1686
- Fuel Modelling at Extended Burnup (FUMEX-II) — IAEA TECDOC Series No. 1687
- Integration of Nuclear Spectrometry Methods as a New Approach to Material Research — IAEA TECDOC Series No. 1669
- Role of Thorium to Supplement Fuel Cycles of Future Nuclear Energy Systems — IAEA Nuclear Energy Series No. NF-T-2.4
- Specific Considerations and Milestones for a Research Reactor Project — IAEA Nuclear Energy Series No. NP-T-5.1
- Spent Fuel Performance Assessment and Research: Final Report of a Coordinated Research Project (SPAR-II) — IAEA TECDOC Series No. 1680
- Structural Materials for Liquid Metal Cooled Fast Reactor Fuel Assemblies — Operational Behaviour — IAEA Nuclear Energy Series No. NF-T-4.3

Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

- Human Resource Development for Introducing and Expanding Nuclear Power Programmes: Summary of an International Conference, Abu Dhabi, United Arab Emirates, 14–18 March 2010 — Proceedings Series
- Knowledge Management for Nuclear Research and Development Organizations — IAEA TECDOC Series No. 1675

Nuclear Science

- Application of Radiotracer Techniques for Interwell Studies — IAEA Radiation Technology Series No. 3
- Atomic and Plasma–Material Interaction Data for Fusion, Vol. 15
- Development of Novel Adsorbents and Membranes by Radiation-Induced Grafting for Selective Separation in Environmental and Industrial Applications — IAEA Radiation Technology Reports Series No. 3
- Fusion Physics
- Neutron Generators for Analytical Purposes — IAEA Radiation Technology Reports No. 1
- Neutron Transmutation Doping of Silicon at Research Reactors — IAEA TECDOC Series No. 1681
- Role of Nuclear Based Techniques in Development and Characterization of Materials for Hydrogen Storage and Fuel Cells — IAEA TECDOC Series No. 1676

Food and Agriculture

- Animal Production and Health Newsletter, Nos 55 and 56, January and July 2012
- Food and Environmental Protection Newsletter, Vol. 15, Nos 1 and 2, January and July 2012
- Greater Agronomic Water Use Efficiency in Wheat and Rice Using Carbon Isotope Discrimination — IAEA TECDOC Series No. 1671
- Improved and Harmonized Quality Control for Expanded Tsetse Production, Sterilization and Field Application — IAEA TECDOC Series No. 1683
- Soils Newsletter, Vol. 34, No.2, and Vol. 35, No.1, January and July 2012

Human Health

- Assessment of Iron Bioavailability in Humans Using Stable Iron Isotope Techniques — IAEA Human Health Series No. 21
- Cyclotron Produced Radionuclides: Guidance on Facility Design and Production of [¹⁸F]Fluorodeoxyglucose (FDG) — IAEA Radioisotopes and Radiopharmaceuticals Series No. 3
- Cyclotron Produced Radionuclides: Operation and Maintenance of Gas and Liquid Targets — IAEA Radioisotopes and Radiopharmaceuticals Series No. 4
- Justification of Medical Exposure in Diagnostic Imaging: Proceedings of an International Workshop held in Brussels, Belgium, 2–4 September 2009 — Proceedings Series
- Nuclear Cardiology: Guidance and Recommendations for Implementation in Developing Countries — IAEA Human Health Series No. 23
- Nuclear Cardiology: Its Role in Cost Effective Care — IAEA Human Health Series No. 18
- Nuclear Data for the Production of Therapeutic Radionuclides — Technical Reports Series No. 473
- Quality Assurance Programme for Computed Tomography: Diagnostic and Therapy Applications — IAEA Human Health Series No. 19
- Radiotherapy in Palliative Cancer Care: Development and Implementation — IAEA Human Health Reports No. 2
- Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (IDOS): Proceedings of an International Symposium held in Vienna, Austria 9–12 November 2010 (2 Volumes) — Proceedings Series

Water Resources

- Efficient Water Management in Water Cooled Reactors — IAEA Nuclear Energy Series No. NP-T-2.6
- Monitoring Isotopes in Rivers: Creation of the Global Network of Isotopes in Rivers (GNIR) — IAEA TECDOC Series No. 1673

Environment

- Sources and Measurements of Radon and Radon Progeny Applied to Climate and Air Quality Studies — Proceedings Series

Radioisotope Production and Radiation Technology

- Control of Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries — Specific Safety Guide — IAEA Safety Standards Series No. SSG-17
- Nuclear Data for the Production of Therapeutic Radionuclides — Technical Reports Series No. 473

Incident and Emergency Preparedness and Response

- Communication with the Public in a Nuclear or Radiological Emergency — Emergency Preparedness and Response Series No. EPR-Public Communications 2012
- Communication with the Public in a Nuclear or Radiological Emergency — Training Materials — Emergency Preparedness and Response Series No. EPR-Public Communications/T 2012
- Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme — Emergency Preparedness and Response Series No. EPR-Embarking 2012
- Lessons Learned from the Response to Radiation Emergencies (1945–2010) — Emergency Preparedness and Response Series No. EPR-Lessons Learned 2012

Safety of Nuclear Installations

- Establishing the Safety Infrastructure for a Nuclear Power Programme — IAEA Safety Standards Series No. SSG-16
- Licensing the First Nuclear Power Plant — INSAG Series No. 26
- Low Level Event and Near Miss Process for Nuclear Power Plants: Best Practices — Safety Reports Series No. 73
- Monitoring for Compliance with Remediation Criteria for Sites — Safety Reports Series No. 72
- Research Reactors: Safe Management and Effective Utilization: Proceedings of an International Conference, Rabat, Morocco, 14–18 November 2011 — Proceedings CD Series
- Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report — IAEA Safety Standards Series No. SSG-20
- Safety Culture in Pre-operational Phases of Nuclear Power Plant Projects — Safety Reports Series No. 74
- Safety in the Utilization and Modification of Research Reactors — IAEA Safety Standards Series No. SSG-24
- Safety of Nuclear Power Plants: Design — Specific Safety Requirements — IAEA Safety Standards Series No. SSR-2/1
- Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors — IAEA Safety Standards Series No. SSG-22
- Volcanic Hazards in Site Evaluation for Nuclear Installations — IAEA Safety Standards Series No. SSG-21

Radiation and Transport Safety

- Environmental Modelling for Radiation Safety (EMRAS) — A Summary Report of the Results of the EMRAS Programme (2003–2007) — IAEA TECDOC Series No. 1678
- Exemption from Regulatory Control of Goods Containing Small Amounts of Radioactive Material — IAEA TECDOC Series No. 1679
- Radiation Protection and NORM Residue Management in the Titanium Dioxide and Related Industries — Safety Reports Series No. 76
- Regulations for the Safe Transport of Radioactive Material, 2012 Edition — Specific Safety Requirements — IAEA Safety Standards Series No. SSR-6

Management of Radioactive Waste

- Monitoring for Compliance with Exemption and Clearance Levels — Safety Reports Series No. 67
- Monitoring for Compliance with Remediation Criteria for Sites — Safety Reports Series No. 72
- Peer Review of Radioactive Waste Management Activities of COVRA, Netherlands — Education and Training in Radiation, Transport and Waste Safety No. TranSAS-8
- Radiation Protection and NORM Residue Management in the Titanium Dioxide and Related Industries — Safety Reports Series No. 76

- Review of Sealed Source Designs and Manufacturing Techniques Affecting Disused Source Management — IAEA TECDOC Series No. 1690
- Storage of Spent Nuclear Fuel — IAEA Safety Standards Series No. SSG-15
- The Safety Case and Safety Assessment for the Disposal of Radioactive Waste — IAEA Safety Standards Series No. SSG-23

Nuclear Security

- INPRO Collaborative Project: Proliferation Resistance: Acquisition/Diversion Pathway Analysis (PRADA) — IAEA TECDOC Series No. 1684
- Nuclear Security Systems and Measures for Major Public Events — IAEA Nuclear Security Series No. 18

Table A19. Training courses, seminars and workshops in 2012

Nuclear Power

- Course on leadership and management for expanding nuclear power programmes
United States of America
- Course on leadership and management of nuclear power programmes
France
- Course on nuclear power plant contracting, pre-construction, construction and management
China
- Course on technical aspects on feasibility, contracting and construction of a nuclear power plant
Republic of Korea
- Course on the IAEA's supply analysis tool MESSAGE
Indonesia
- Energy information system for Western African countries
Senegal
- GCC regional school on nuclear energy management
United Arab Emirates
- IAEA/RCA regional course on application of stable isotopes (carbon-13, nitrogen)
Sri Lanka
- Interregional course on uranium production from phosphate rocks
Jordan
- Nuclear power infrastructure: Introduction
Niger
- Pressurized water reactor availability for near term deployment
Republic of Korea
- Regional course on operating fundamentals of water cooled reactors with PC based simulators
Republic of Korea
- Regional course on the nuclear power human resource (NPHR) modelling tool
Malaysia
- Regional workshop on providing decision support for nuclear power planning and development
Japan
- Safety assessment of nuclear power plants
United States of America
- School of nuclear knowledge management
Italy

Nuclear Fuel Cycle and Materials Technologies

- Light water reactors
Ukraine
- Sustainable uranium resources development
United Republic of Tanzania
- Tools and methodologies for nuclear reactor technology assessment
Austria
- Uranium deposit models and exploration
China
- Uranium geology and exploration
Madagascar

- Uranium resources assessment and recovery
Egypt

Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

- Analysis of energy demand — use of the IAEA's tool MAED
Mauritania
- Developing regional electricity power plans using MESSAGE
Malawi
- E-learning MESSAGE for analysing nuclear options in nuclear energy management
Republic of Korea
- Energy demand analysis and projections using the IAEA's tool MAED
Benin; Burundi; Seychelles
- E-training workshop on the IAEA energy demand model MAED
United Republic of Tanzania
- Financial analysis of future power projects applying IAEA's FINPLAN model
Jamaica
- IAEA's analytical tool MESSAGE and kick-off meeting
Uruguay
- IAEA's analytical tools for elaborating sustainable energy strategies (MESSAGE)
Sudan
- Integrated management systems and development of safety culture
United States of America
- Model for analysis of energy demand (MAED)
Zimbabwe
- National course in the IAEA model MAED
Albania
- National course on energy demand analysis and projections using the IAEA model MAED
Cambodia; Nepal
- National course on energy supply system analysis and planning
Nepal
- National course on IAEA's tool MESSAGE
Albania
- National course on the IAEA's energy planning model MESSAGE
Sri Lanka
- Project launch and on the IAEA energy demand model MAED
United Republic of Tanzania
- Regional course on constructing the indicator for sustainable energy development
Austria
- Regional course on effective and sustainable regulatory control of radiation sources
Indonesia
- Seminar on energy options and workshop of energy economics
Oman
- Use of ICT materials in radiation protection
Botswana

Nuclear Science

- Advanced characterization of cultural heritage artefacts using nuclear analytical techniques
Albania

- Characterization of CH objects
Malta
- Cultural heritage
Portugal
- Digital industrial radiography technique for personnel certified in level II
Malaysia
- Electronics for maintenance staff
Nigeria
- National course on the implementation of ISO standard 17025
Oman
- Nuclear applications based on the UNIO52 using FPGA and LabView programming technology
Bangladesh
- Operation and maintenance of gamma cameras
Democratic Republic of the Congo
- Preparation of reference materials
Jordan
- Regional course on atmospheric aerosol sampling procedures and analysis techniques using ion beam
Hungary
- Regional course on maintenance of gamma cameras
Cuba
- Repair and maintenance of HARSHAW TLD readers
United Republic of Tanzania
- Statistical tools for data evaluation related to homogeneity and stability studies
Austria

Food and Agriculture

- Advanced plant tissue culture techniques
Ghana
- African and classic swine fever
Austria
- Area-wide integrated pest management campaign
Burkina Faso
- Course on early and rapid nuclear and nuclear-related diagnostic and tracing
Turkey
- Fallout radionuclide based techniques for soil erosion assessment
Tunisia
- Food contaminants such as cycotoxins at DPQC
Benin
- Fruit fly surveillance, taxonomy and identification
Benin; France
- Group training on developing germplasm using mutation and genomic approaches
Austria
- IAEA/RCA regional course on application of molecular markers to mutation breeding programme
Australia
- Irrigation scheduling and nutrient management
Ethiopia
- Method validation for inorganic contaminants
Brazil

- Method validation for pesticides (Pedro Leopoldo/Belo Horizonte)
Brazil
- Methodologies and mechanisms for screening against abiotic stress
Austria
- Molecular diagnostic for transboundary animal diseases
Uganda
- Molecular epidemiology and bioinformatics in TADs surveillance
Kenya
- Molecular markers
South Africa
- Mutation breeding techniques and handling of mutated populations
Egypt
- National course on application of isotopic and nuclear techniques for soil, water and nutrients
Malaysia
- Quality assurance and quality control measures for pesticide residue analysis
Belize
- Quarantine and pest risk analysis
Austria
- Regional course on artificial insemination in small ruminants
Tunisia
- Regional course on molecular diagnostics for transboundary animal diseases
China
- Regional course on the use of Internet based geospatial information visualization tools
Mexico
- Screening methodologies and pesticide residue analysis by quenchers
Costa Rica
- Sorghum and millet breeding with emphasis on breeding for biotic and abiotic strains
Eritrea
- Train the trainers course on soil management and crop production
Austria
- Tsetse flies for molecular tsetse population genetic and morphometric analyses
Kenya

Human Health

- Acceptance test of dual head gamma cameras
Austria
- Accidents and audits in radiotherapy and peer review
United States of America
- Accuracy requirements on uncertainty in radiotherapy
Morocco
- Advanced treatment planning
Czech Republic
- Best practice in radiation oncology to train radiation technology trainers
Austria
- Bringing new radiation technology into the clinic: An evidence-based approach
Russian Federation
- Calibration of external beam radiotherapy equipment
Qatar

- Cardiology nephrology and radiopharmacy
South Africa
- Clinical applications of radionuclide therapy
Argentina
- Clinical quality assurance in radiotherapy
Costa Rica
- Commissioning and quality assurance for radiotherapy
Serbia
- Course on QC of radiotherapy equipment
Malaysia
- Data management and final analysis
Sudan
- Diagnostic CT and PET/CT
Austria
- EANM PET/CT in oncology, advanced
Austria
- EANM technologist PET/CT
Austria
- Evidence based brachytherapy
Zimbabwe
- Evidence based multidisciplinary management of breast cancer
Peru
- Evidence based radiation oncology: A clinical refresher course with a methodology
Slovenia
- Evidence based treatment of head and neck cancer
Zambia
- Frontline servicing of a best equinox cobalt teletherapy unit
Tunisia
- Hybrid imaging in head and neck cancers
Italy
- Hybrid imaging: SPECT/CT
Lithuania
- Hybrid modalities SPECT/CT and PET/CT for technologists
Brazil
- IAEA national workshop to train radiation technology trainers (RTTs)
Israel
- IAEA/EANM therapy and basic dosimetry
Austria
- IAEA/RCA course on image based radiotherapy (uro-genital)
Japan
- Image processing, analysis and quantification as well as image fusion
Egypt
- Imaging in ischemic heart disease and cardiac failure
Myanmar
- Imaging techniques in diagnostic and prognostic assessment of heart failure
Cuba
- Medical physics aspects in low and high dose rate brachytherapy
Saudi Arabia

- Modern brachytherapy techniques
United Kingdom
- National course on QA/QC and dosimetry in radiotherapy
Bosnia and Herzegovina
- National course on QC of radiotherapy equipment
Malaysia
- Non-imaging nuclear medicine instrumentation
Democratic Republic of the Congo
- PET in radiation oncology
Austria
- PET/CT in oncology, basic
Austria
- Quality assurance in FTIR analysis of deuterium enrichment
Paraguay
- Quality control and dosimetry in radiology
Uzbekistan
- QUATRO auditing methodologies for use by hospital staff
Thailand
- Radiation protection in vascular surgery
Thailand
- Radiation safety for radiologists
Mauritania
- Regional course for potential auditors using the QUATRO method for comprehensive audits
Indonesia
- Regional course in hypofractionation and fractionated stereotactic radioteraphy
Argentina
- Regional course on clinical applications of PET/CT for nuclear medicine physicians
Uruguay
- Regional course on code of practice for the radiation sterilization of tissue allografts
Argentina
- Regional course on current concepts in radiation oncology for radiation therapy technologist
Mexico
- Regional course on current status of radionuclide therapy for thyroid disease
Nicaragua
- Regional course on image based RT for H&N and breast cancers
India
- Regional course on standardized quality control procedures
Poland
- Regional course on stereotactic body radiotherapy: basic concepts and early implementation
Singapore
- Regional course on quality reporting of hybrid imaging procedures (SPECT/CT&PET/CT) in oncology
Australia
- Role of nuclear medicine in Chagas disease
Colombia
- Sentinel lymph node and radio-guided surgery
Chile
- Standardization of the methodology used to assess infant feeding practices
Brazil

Water Resources

- Application of isotope techniques in water resource studies
Egypt
- Environmental isotope techniques applicable to groundwater studies
Philippines
- Geospatial information techniques to be used in isotope hydrology
Morocco

Environment

- Advanced radioactive trace applications in marine pollution studies
Italy
- Air sampling and nuclear analytical characterisation of atmospheric particulates
Croatia
- Applied data evaluation and interpretation of organic and inorganic contaminants
Uruguay
- Estimation of uncertainty in analytical measurements
Zimbabwe
- Gestion d'un parc de mesure, étalonnage et verification
Ivory Coast
- Harmonization of monitoring sample design
Morocco
- IAEA/RCA regional course on assessment of radiological risks at the basic level
Thailand
- Implementation of ISO 15189 standard
Morocco
- Marine radioactivity: Analytical techniques and quality management
Germany
- Method validation and measurement uncertainty for testing and calibration laboratories
Ivory Coast
- Method validation and uncertainty measurements in chemical analysis
Zambia
- Method validations and estimation of measurement uncertainty
Namibia
- Quality assurance of fingerprint and source apportionment data
Indonesia
- Quality management in industry and testing and metrology laboratories
Democratic Republic of the Congo
- RCA regional course on the use of quality management system for new entrants
Republic of Korea
- Regional course on assessment and reconstruction of past history of harmful algal blooms
Cuba
- Regional course on assessment and reconstruction of past history of harmful algal blooms
Cuba
- Regional course on trace elements analysis in marine samples
Monaco
- Workshop on the principle of receptor binding assay (RBA) technology
Thailand

Radioisotope Production and Radiation Technology

- Alpha spectrometry and radiochemical techniques
South Africa
- Application of digital radiography and computed tomography to metal, automotive industries
Republic of Korea
- Capacity building for enhanced gamma scanning of industrial process
Tunisia
- Dosimeters preparation and calibration
Jordan
- Establishment and use of an uncertainty budget for dose in product
Hungary
- Gamma ray spectrometry
Morocco
- Hospital radiopharmacy
Kenya
- Method validation and uncertainty estimation
Argentina
- Protection level calibrations
Algeria
- Radiolabelled blood products including radiolabelled white cell for infection imaging
South Africa
- Radiotracer data analysis using flow rig
Kenya
- Regional course on capacity building for enhanced gamma scanning of industrial process column
Thailand
- Regional course on common core for level 3 and ultrasonic testing
Brazil
- Regional course on Monte Carlo simulations for CT, RPT, SPECT and design of radiotracer experiments
Republic of Korea
- Requirements and implementation of ISO 11137 standard
Tunisia
- Testing of radiopharmaceuticals and design/upgrading of a radiopharmacy facility
Cameroon

Incident and Emergency Preparedness and Response

- Application of the requirements (GS-R-2) and guidance on developing national capabilities
Costa Rica; Paraguay
- EPR method for application of GSR-2 on developing a national capability for emergency response
United Arab Emirates
- First medical response
Croatia
- First response to radiological emergencies
Panama
- Generic procedures for response to a nuclear or radiological emergency at research reactors
Russian Federation
- Medical response to radiation emergencies
Bolivia; Costa Rica

- Public communications in radiation emergencies
Botswana
- Regional course for medical response to radiation emergency
Dominican Republic

Safety of Nuclear Installations

- Gradual application of IAEA safety standards for establishing a safety infrastructure
Austria
- National course on dimensioning accidents without loss of fluid
Vietnam
- Safety review and assessment
Egypt
- SAT and RASIMS
Austria

Radiation and Transport Safety

- Basic introduction to radiation protection
Gabon
- Dosimetry and quality assurance of external beam radiotherapy
Russian Federation
- Effective and sustainable regulatory control of radiation sources
Islamic Republic of Iran
- General safety provisions for predisposal management, clearance regime, and control
Democratic Republic of the Congo
- Managerial and technical requirements for compliance with the ISO 17025 standard
Hungary
- Medical uses of radiation sources
Belarus
- National course on radiation safety in industrial applications
Oman
- Occupational radiation protection for NORM
Egypt
- Orphan sources search
Morocco; United Republic of Tanzania
- Post-graduate education course on radiation protection
Ghana; Greece
- Post-graduate education course on radiation protection and the safety of radiation sources
Belarus
- Public and environmental exposure models and related radiation monitoring
Albania
- Quality management in the provision of external radiation services
Ghana
- Radiation protection and optimization in interventional procedures
Nicaragua
- Radiation protection and safety of radiation sources
Argentina
- Radiation protection and the safety of radioactive sources
Malaysia

- Radiation safety for customs officers
Uganda
- Regional course on radiation protection with emphasis in mammography
Guatemala
- Regional course on reducing the risks from indoor radon: Establishing national radon strategy
Indonesia
- Regional course on regulatory control in PET/CT cyclotrons
Brazil
- Regional course on the safe transport of radioactive material and Introduction of SAT
Jordan
- Regional post-graduate course on nuclear safety
Argentina
- Regulatory Authority Information System RAIS 3.2 web
Chile
- Training course: DSRS tracking system
Slovenia

Management of Radioactive Waste

- Borehole disposal of DSRS
South Africa
- Cradle to grave management of radioactive sources
Morocco
- Elements of environmental impact assessment of uranium mining operations
Niger
- Identifying and managing uncertainty for post-closure safety assessments
Portugal
- Monitoring in argillaceous and crystalline rocks in the context of repository
Switzerland
- Nuclear facility decommissioning and environmental remediation skills
United States of America
- Predisposal management of radioactive waste
Russian Federation
- Radiation protection and monitoring of radiological impacts on the environment
Niger
- Radioactive waste disposal
France; Poland
- RWM system responsibilities allocation
Nigeria

Nuclear Security

- Element 2: Remediation infrastructure development at a test site
Germany
- Introduction to nuclear forensics
Republic of Moldova
- Notification, reporting and requesting assistance
Austria
- Nuclear security culture
Morocco; Peru

- Physical protection of radioactive sources
Ukraine
- Regional course on introduction to nuclear forensics
Chile
- Transport of radioactive material
Ghana

Nuclear Verification

- Regional training course on nuclear material accountancy
Austria
- Safeguards and security for newcomers
Finland

Legal Services

- International School of Nuclear Law
France
- National workshop on legal and regulatory infrastructure
Niger
- National workshop on nuclear law
Ghana; Lesotho; United Arab Emirates
- Second session of the Nuclear Law Institute
Austria
- Workshop on civil liability for nuclear damage
Headquarters
- Workshop for diplomats on nuclear law
Headquarters

Management of Technical Cooperation for Development

- Eighth annual WNU Summer Institute
United Kingdom
- Indicator for sustainable energy development (ISED)
Jamaica
- Master in medical physics
Peru
- Maximization of resources for sustainable increase of wheat and barley productivity
United Kingdom
- Regional course on PET radiopharmacy
Argentina
- WNU on radiation technologies
Republic of Korea

Table A20. Relevant Agency web sites

Public web site

<http://www.iaea.org/>

Nuclear Power

Nuclear energy

<http://www.iaea.org/OurWork/ST/NE/index.html>

Nuclear power

<http://www.iaea.org/NuclearPower/>

Nuclear power technology development

<http://www.iaea.org/NuclearPower/Technology/>

Nuclear power engineering

<http://www.iaea.org/NuclearPower/Engineering/>

Nuclear energy knowledge resources

<http://www.iaea.org/inisnkm/nek/index.html>

INPRO

<http://www.iaea.org/INPRO/>

Planning and economic studies

<http://www.iaea.org/OurWork/ST/NE/Pess/index.shtml>

International Nuclear Information System and Nuclear Knowledge Management

<http://www.iaea.org/inisnkm/>

Nuclear energy databases

<http://www.iaea.org/OurWork/ST/NE/databases.html>

Nuclear Fuel Cycle and Materials Technologies

Nuclear fuel cycle and waste technology

<http://www.iaea.org/OurWork/ST/NE/NEFW/index.html>

Integrated Nuclear Fuel Cycle Information System (iNFCIS)

<http://www-nfcis.iaea.org/>

Nuclear Science

Portal for medical related nuclear data

<http://www-nds.iaea.org/medportal/>

Research Reactor Database

<http://www.iaea.org/worldatom/rrdb/>

Information on ageing related operating experience from research reactors around the world (available to research reactor operators)

http://www.iaea.org/OurWork/ST/NE/NEFW/rrg_operation.html

Nuclear Applications

Joint FAO/IAEA Programme on Nuclear Techniques in Food and Agriculture

<http://www-naweb.iaea.org/nafa/index.html>

Physical and chemical sciences

<http://www-naweb.iaea.org/napc/ih/index.html>

Food and Agriculture

Agency managed database for officially released mutant varieties

<http://mvgs.iaea.org/>

Human Health

Programme of Action for Cancer Therapy (PACT)

<http://cancer.iaea.org/index.asp>

Guidance and educational resources to Member States

<http://nucleus.iaea.org/apps/HHW/root/content/MedicalPhysics>

Distance Assisted Training on-line (DATOL)

<http://nucleus.iaea.org/apps/HHW/root/content/Technologists/NuclearMedicine/Educationalresources/DistanceAssistedTrainingforNuclearMedicineTechnologists>

Training materials for distance learning

<http://www-naweb.iaea/nahu/default.asp>

Water Resources

Isotope measurements from non-Agency projects on rivers and groundwater (available to Member States)

<http://www.iaea.org/water>

Environment

Reference material web site

<http://nucleus.iaea.org/rpst/index.htm>

Incident and Emergency Preparedness and Response

Early Notification and Assistance Conventions (ENAC) web site and the Nuclear Events Web-based System

<http://www-news.iaea.org/news/>

Incidents and emergencies

<http://www-ns.iaea.org/tech-areas/emergency/>

Radiation and Transport Safety

Radiation Safety Information Management System (RASIMS)

<http://rasims.iaea.org>

Radiation safety

<http://rpop.iaea.org/RPoP/RPoP/Content/index.htm>

Radiation, transport and waste safety

<http://www-ns.iaea.org/home/rtws.asp>

Nuclear installation safety

<http://www-ns.iaea.org/home/nis.htm>

Safeguards

<http://www.iaea.org/OurWork/SV/Safeguards/index.html>

Management of Technical Cooperation for Development

<http://www.iaea.org/technicalcooperation>

Regional Sites

Africa

<http://www.iaea.org/technicalcooperation/Regions/Africa/index.html>

Asia and the Pacific

<http://www.iaea.org/technicalcooperation/Regions/Asia-and-the-Pacific/index.html>

Europe

<http://www.iaea.org/technicalcooperation/Regions/Europe/index.html>

Latin America

<http://www.iaea.org/technicalcooperation/Regions/Latin-America/index.html>

TC PRIDE

<http://pcmf.iaea.org/Default.aspx?tabid=36> (Please use the My TC PRIDE tab)

TC Country Profile

<http://wwwtc.iaea.org/TCCountryProfile/>

Standards, Guides and Conventions

International standards, guides and codes

<http://www.iaea.org/Publications/Standards/index.html>

International conventions and agreements

<http://www.iaea.org/Publications/Documents/Conventions/index.html>

Legal Assistance

<http://ola.iaea.org/OLA/index.html>

Table A21. Facilities under Agency safeguards or containing safeguarded nuclear material on 31 December 2012

State ^a	Name of facility	Location ^a
Power reactors		
Argentina	Atucha I Nuclear Power Plant	Lima
	Atucha II Nuclear Power Plant	Lima
	Carem	Lima
	Embalse Nuclear Power Plant	Embalse
Armenia	Armenian NPP	Metsamor
	Armenian NPP 3	Metsamor
Belgium	Doel 3 NPP	Doel
	Doel 4 NPP	Doel
	Elbel. Doel 1	Doel
	Elbel. Tih. 1	Tihange
	Tihange 2 NPP	Tihange
	Tihange 3 NPP	Tihange
Brazil	Admiral Alva. Alberto-(Angra2)	Angra Dos Reis
	Admiral Alva. Alberto-(Angra3)	Agra Dos Reis
	Alm. Alv. Alberto (Angra1)	Angra Dos Reis
Bulgaria	NPP Kozloduy 1-2	Kozloduy
	NPP Kozloduy 3-4	Kozloduy
	NPP Kozloduy 5 - 6	Kozloduy
Canada	Bruce A	Tiverton, Ontario
	Bruce B.	Tiverton, Ontario
	Darlington	Bowmanville, Ontario
	Gentilly II	Gentilly, Quebec
	Pickering	Pickering, Ontario
	Point Lepreau	Pt. Lepreau, New Brunswick
China	QSNPP	Hai Yan, Zhe Jiang
Czech Republic	NPP Dukovany (Edu-1)	Dukovany
	NPP Dukovany (Edu-2)	Dukovany
	NPP Temelin	Temelin
Finland	Loviisa NPP	Loviisa
	TVO I	Olkiluoto
	TVO II	Olkiluoto
	TVO III	Olkiluoto
Germany	AVR	Juelich
	HKG-THTR 300	Hamm
	KKW Brokdorf	Brokdorf
	KKW Brunsbuettel	Brunsbuettel
	KKW GR3. 5	Lubmin

State ^a	Name of facility	Location ^a
	KKW Grafenrheinfeld	Grafenrheinfeld
	KKW Greifswald 1 & 2	Lubmin
	KKW Grohnde	Emmerthal
	KKW Gundremmingen, Block B	Gundremmingen
	KKW Gundremmingen, Block C	Gundremmingen
	KKW Isar 1	Essenbach
	KKW Isar 2	Essenbach
	KKW Krummel	Geesthacht
	KKW Neckarwestheim 1	Neckarwestheim
	KKW Neckarwestheim 2	Neckarwestheim
	KKW Obrigheim	Obrigheim
	KKW Philippsburg 1	Philippsburg
	KKW Philippsburg-2	Philippsburg
	KKW Rheinsberg	Rheinsberg
	KKW Unterweser	Unterweser
	KKW Emsland	Lingen (Ems)
	KW Biblis A	Biblis
	KW Biblis B	Biblis
	KW Muelheim-Kaerlich	Muelheim-Kaerlich
	KWL-Lingen	Lingen
	NS Otto Hahn	Geesthacht
Hungary	MVM Paks NPP Ltd. I	Paks
	MVM Paks NPP Ltd. II	Paks
India	KAPS 1 & 2	Surat, Gujarat
	KKNPP	Kudankulam
	RAPS 1 & 2	Rawatbhata, Rajasthan
	RAPS 3 & 4	Rawatbhata, Rajasthan
	RAPS 5 & 6	Rawatbhata, Rajasthan
	TAPS	Tarapur, Maharashtra
Iran, Islamic Republic of	Bushehr NPP	Bushehr , Halilem
	IR360	IR360
Italy	Area Disattivazione Caorso	Caorso
	Centrale Latina	Borgo Sabotino
	Centrale Nucleare Di Trino	Trino Vercellese
	Cirene (On Load)	
	So.G.I.N. CN Del Garigliano	Sessa Aurunca(CE)
Japan	Fuku-I-1	Futaba-Gun, Fukushima-Ken
	Fuku-I-2	Futaba-Gun, Fukushima-Ken
	Fuku-I-3	Futaba-Gun, Fukushima-Ken

State ^a	Name of facility	Location ^a
	Fuku-I-4	Futaba-Gun, Fukushima-Ken
	Fuku-I-5	Futaba-Gun, Fukushima-Ken
	Fuku-I-6	Futaba-Gun, Fukushima-Ken
	Fuku-N-1	Futaba-Gun, Fukushima-Ken
	Fuku-N-2	Futaba-Gun, Fukushima-Ken
	Fuku-N-3	Futaba-Gun, Fukushima-Ken
	Fuku-N-4	Futaba-Gun, Fukushima-Ken
	Genkai-1	Higashimatsuura-Gun, Saga-Ken
	Genkai-2	Higashimatsuura-Gun, Saga-Ken
	Genkai-3	Higashimatsuura-Gun, Saga-Ken
	Genkai-4	Higashimatsuura-Gun, Saga-Ken
	Hamaoka-1	Ogasa-Gun, Shizuoka-Ken
	Hamaoka-2	Ogasa-Gun, Shizuoka-Ken
	Hamaoka-3	Ogasa-Gun, Shizuoka-Ken
	Hamaoka-4	Ogasa-Gun, Shizuoka-Ken
	Hamaoka-5	Ogasa-Gun, Shizuoka-Ken
	Higashidoori-1	Shimokita-Gun, Aomori-Ken
	Higashidoori-1	Shimokita-Gun, Aomori-Ken
	Ikata-1	Nishiuwa-Gun, Ehime-Ken
	Ikata-2	Nishiuwa-Gun, Ehime-Ken
	Ikata-3	Nishiuwa-Gun, Ehime-Ken
	Joyo	Higashi, Ibaraki-Ken
	Kaminoseki-1	Kumage-Gun, Yamaguchi-Ken
	Kashiwazaki-1	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-2	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-3	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-4	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-5	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-6	Kashiwazaki-Shi, Niigata-Ken
	Kashiwazaki-7	Kashiwazaki-Shi, Niigata-Ken
	Mihama-1	Mikata-Gun, Fukui-Ken
	Mihama-2	Mikata-Gun, Fukui-Ken
	Mihama-3	Mikata-Gun, Fukui-Ken
	Monju	Tsuruga-Shi, Fukui-Ken
	Ohi 1&2	Ohi-Gun, Fukui-Ken
	Ohi 3	Ohi-Gun, Fukui-Ken
	Ohi 4	Ohi-Gun, Fukui-Ken
	Ohma	Shimokita-Gun, Aomori-Prefect.
	Onagawa-1	Oshika-Gun, Miyagi-Ken

State ^a	Name of facility	Location ^a
	Onagawa-2	Oshika-Gun, Miyagi-Ken
	Onagawa-3	Oshika-Gun, Miyagi-Ken
	Sendai-1	Sendai-Shi, Kagoshima-Ken
	Sendai-2	Sendai-Shi, Kagoshima-Ken
	Sendai-3	Satsumasendai-Shi
	Shika-1	Hakui-Gun, Ishikawa-Ken
	Shika-2	Hakui-Gun, Ishikawa-Ken
	Shimane-1	Yatsuka-Gun, Shimane-Ken
	Shimane-2	Yatsuka-Gun, Shimane-Ken
	Shimane-3	Yatsuka-Gun, Shimane-Ken
	Takahama-1	Ohi-Gun, Fukui-Ken
	Takahama-2	Ohi-Gun, Fukui-Ken
	Takahama-3	Ohi-Gun, Fukui-Ken
	Takahama-4	Ohi-Gun, Fukui-Ken
	Tokai	Tokai-Mura, Ibaraki-Ken
	Tokai-2	Tokai-Mura, Ibaraki-Ken
	Tomari-1	Fururu-Gun, Hokkaido
	Tomari-2	Fururu-Gun, Hokkaido
	Tomari-3	Fururu-Gun, Hokkaido
	Tsuruga-1	Tsuruga-Shi, Fukui-Ken
	Tsuruga-2	Tsuruga-Shi, Fukui-Ken
Kazakhstan	BN-350	Aktau
Korea, Republic of	Kori-1	Pusan
	Kori-2	Pusan
	Kori-3	Pusan
	Kori-4	Pusan
	Shin Kori-1	Pusan
	Shin Kori-2	Pusan
	Shin Kori-3	Pusan
	Shin Kori-4	Pusan
	Shin Kori-5	Pusan
	Shin Kori-6	Pusan
	Shin Wolsong-1	Kyongju
	Shin Wolsong-2	Kyongju
	Ulchin-1	Ulchin
	Ulchin-2	Ulchin
	Ulchin-3	Ulchin
	Ulchin-4	Ulchin
	Ulchin-5	Ulchin

State ^a	Name of facility	Location ^a
	Ulchin-6	Ulchin
	Ulchin-7	Ulchin
	Ulchin-8	Ulchin
	Wolsong-1	Kyongju
	Wolsong-2	Kyongju
	Wolsong-3	Kyongju
	Wolsong-4	Kyongju
	Younggwang-1	Younggwang
	Younggwang-2	Younggwang
	Younggwang-3	Younggwang
	Younggwang-4	Younggwang
	Younggwang-5	Younggwang
	Younggwang-6	Younggwang
Lithuania	Ignalina NPP	Visaginas
Mexico	Central Laguna Verde Unit I	Muni. Al. Luc. Veracruz
	Central Laguna Verde Unit II	Muni. Al. Luc. Veracruz
Netherlands	Epz. Borssele	Borssele
	N. V. GKN-Dodewaard	Dodewaard
Pakistan	Chasnupp 2	
	Chasnupp-1	Kundian, District Mianwali
	Kanupp	Karachi
Philippines	BNPP	Morong, Bataan
Romania	Cernavoda-3	Cernavoda
	Cernavoda-4	Cernavoda
	CNE Cernavoda 1	Cernavoda
	CNE Cernavoda NPP 2	Cernavoda
Slovakia	JAVYS NPP A-1	Jaslovske Bohunice
	JAVYS NPP V-1	Jaslovske Bohunice
	NPP Mochovce Units 1 & 2	Mochovce
	NPP Mochovce Units 3 & 4	Mochovce
	V-2 NPP	Jaslovske Bohunice
Slovenia	Krško (NEK)	Krško
South Africa	Koeberg Unit I	Cape Town
	Koeberg Unit II	Cape Town
Spain	Asco 2	Asco
	Asco NPP 1	Asco
	C.N. Almaraz 1	Almaraz
	C.N. Almaraz 2	Almaraz
	C.N. Cofrentes	Cofrentes

State ^a	Name of facility	Location ^a
	C.N. De Sta. Maria De Garona	Santa Maria De Garona
	C.N. Jose Cabrera	Almonacid De Zorita
	CN Trillo-1	Trillo
	CN Vandellos II	Vandellos
Sweden	Barsebaeck Unit 1	Loeddekoepinge
	Barsebaeck Unit 2	Loeddekoepinge
	Forsmark Unit 1	Oesthammar
	Forsmark Unit 2	Oesthammar
	Forsmark Unit 3	Oesthammar
	Oskarshamn Unit 1	Oskarshamn
	Oskarshamn Unit 2	Oskarshamn
	Oskarshamn Unit 3	Oskarshamn
	Ringhals Unit 1	Ringhals
	Ringhals Unit 2	Ringhals
	Ringhals Unit 3	Vaeroebacka
	Ringhals Unit 4	Ringhals
Switzerland	KKB Beznau-II	Beznau Doettingen
	KKB Ibeznuu-I	Beznau Doettingen
	KKG-Goesgen	Goesgen-Daeniken
	KKL-Leibstadt	Leibstadt
	KKM Muehleberg	Muehleberg
Ukraine	Chernobyl NPP	Chernobyl
	Khmelnitski 1	Neteshin
	Khmelnitski 2	Neteshin
	Khmelnitski 3	Neteshin
	Khmelnitski 4	Neteshin
	Rovno 1 & 2	Kuznetsovsk
	Rovno 3	Kuznetsovsk
	Rovno 4	Kuznetsovsk
	STH. Ukraine 1	Yuzhnoukrainsk
	STH. Ukraine 2	Yuzhnoukrainsk
	STH. Ukraine 3	Yuzhnoukrainsk
	Zaporozhe 1	Energodar
	Zaporozhe 2	Energodar
	Zaporozhe 3	Energodar
	Zaporozhe 4	Energodar
	Zaporozhe 5	Energodar
	Zaporozhe 6	Energodar
United Arab Emirates	Braka NPP	United Arab Emirates

State ^a	Name of facility	Location ^a
Vietnam	Ninh Thuan 1 Plant Unit 1	Phuoc Dinh Comm. Thuan Nam Dt.
	Ninh Thuan 1 Plant Unit 2	Phuoc Dinh Comm. Thuan Nam Dt.
	Ninh Thuan 2 Plant Unit 1	Vinh Hai Comm. Ninh Hai Dt.
	Vinh Hai Comm. Ninh Hai Dist.	Vinh Hai Comm. Ninh Hai Dt.
Research reactors and critical assemblies		
Algeria	Es Salam Reactor	Ain Oussera
	Nur Reactor	Draria-BP29 Wilaya De Tipaza
Argentina	Argentine Reactor 0 (RA-0)	Cordoba
	Argentine Reactor 1 (RA-1)	Centro Atomico Constituyentes
	Argentine Reactor 3 (RA-3)	Centro Atomico Ezeiza
	Argentine Reactor 4 (RA-4)	Rosario
	Argentine Reactor 6 (RA-6)	Centro Atomico Bariloche
	Argentine Reactor 8 (RA-8)	Pilcaniyeu
Australia	HIFAR	Lucas Heights, Sutherland
	MOATA	Lucas Heights, Sutherland
	OPAL	Lucas Heights, Sutherland
Austria	TRIGA Mark II Reactor	Vienna
Bangladesh	Atomic Energ. Res. Estab.	Dhaka
Belarus	Sosny	Minsk
Belgium	BR1-CEN	Mol
	BR2	Mol
	CEN-VENUS	Mol
	Thetis Universiteit Gent	Gent
Brazil	Argonauta Reactor-IEN	Rio De Janeiro
	Brazilian Multipurpose Reactor	Ipero, Sao Paolo
	IPEN/MB01 Critical Assem.	Sao Paulo
	IRP-R1 Reactor-CDTN	Belo Horizonte
	Research Reactor IEA-R1	Cidade Univ. A. S. D. Oliveira
Bulgaria	IRT-2000	Sofia
Canada	Biology, Chemistry, Physics	Chalk River, Ontario
	DIF	Chalk River, Ontario
	Ecole Polytechnique	Montreal, Quebec
	McMaster Nucl. Reactor	Hamilton, Ontario
	NRU Reactor	Chalk River, Ontario
	NRX Reactor	Chalk River, Ontario
	Slowpoke Alberta	Univ. of Alberta, Edmonton
	Slowpoke Kingston	Kingston, Ontario
	Slowpoke Saskatchewan	Saskatoon, Saskatchewan
Chile	La Reina Reactor	Santiago

State ^a	Name of facility	Location ^a
	Lo Aguirre Experimental React.	Santiago
China	HTR-10	Nankou, Beijing
Colombia	IAN-R1 R. Reactor	Bogota
Czech Republic	LR-0	Řež
	LVR-15	Řež
	VR-1	Prague
Dem. Republic of the Congo	TRIGA II Reactor	Kinshasa
Denmark	Danish Decommissioning - DR3	Roskilde
Egypt	ET RR-1	Inshas
	MPR (Multi Purpose Reactor)	AEA Nuc Res C. Near Inshas
Estonia	A.L.A.R.A.	Paldiski
Finland	FiR 1	Espoo
Georgia	Decom. IRT-M	Tbilisi
Germany	AKR-2	Dresden
	BER-II	Berlin
	FH-Furtwangen	Furtwangen
	FRM	Garching
	FRM II	Garching
	Helmholtz-Zentrum Geesthacht	Geesthacht
	KFA-FRJ2	Juelich
	Labor-ST	Zittau
	SUR100	Hannover
	SUR-100	Stuttgart
	SUR100 FHU	Ulm
	SUR-100 TUB	Berlin
	SUR100-RWTH	Aachen
	TRIGA Mainz	Mainz
Ghana	GHARR-1	Legon-Accra
Greece	GRR-1	Attikis
Hungary	Budapest Res. Reactor	Budapest
	Training Reactor	Budapest
Indonesia	chTkn	Bandung
	PPNY	Yogyakarta
	RSG-GAS	Serpong
Iran, Islamic Republic of	HWZPR	Esfahan
	IR-40	
	LWSCR	Esfahan
	MNSR	Esfahan
	Tehran Res. React.(TRR)	Tehran

State ^a	Name of facility	Location ^a
Israel	Israel R. R.-1(IRR-1)	Soreq
Italy	AGN-201	Palermo
	CEC-Complexe-Essor	Ispra
	CISAM-RTS-1	San Piero A Grado
	CNEN-RB-3	Montecuccolino
	LE.N.A. Pavia	Pavia
	RB-1	Montecuccolino
	TAPIRO-Casaccia	Santa Maria Di Galeria
	TRIGA-RC1 Mark II	Santa Maria Di Galeria
Jamaica	CNS	Kingston
Japan	DCA	Oarai-Machi, Ibaraki-Ken
	FCA	Tokai-Mura, Ibaraki-Ken
	HTR	Kawasaki-Shi, Kanagawa-Ken
	HTTR	Higashi, Ibaraki-Ken
	JMTR	Higashi, Ibaraki-Ken
	JMTRC	Higashi-Gun, Ibaraki-Ken
	JRR-2	Tokai-Mura, Ibaraki-Ken
	JRR-3	Tokai-Mura, Ibaraki-Ken
	JRR-4	Tokai-Mura, Ibaraki-Ken
	KINKI	Higashiosaka-Shi, Osaka-Fu
	KUCA	Osaka
	KUR	Sennan-Gun, Osaka
	Musashi Reactor	Kawasaki-Shi, Kanagawa-Ken
	NCA	Kawasaki-Shi
	NSRR	Tokai-Mura, Ibaraki-Ken
	Rikkyo	Nagasaka, Kanagawa-Ken
	TCA	Tokai-Mura, Ibaraki-Ken
	TODAI	Tokai-Mura, Ibaraki-Ken
	TTR	Kawasaki-Shi, Kanagawa-Ken
	VHTRC	Tokai-Mura, Ibaraki-Ken
Kazakhstan	Kurchatov Test Reactors	Kurchatov
	WWR-K	Almaty
Korea, Republic of	Gijang Research Reactor	Gijang, Busan Metrp. City
	Hanaro	Taejon
	Kyung Hee	Suwoon
Latvia	IRT	Salaspils
Libya	IRT-Tajura	Tajura
Malaysia	Puspati	Bangi, Selangor
Mexico	TRIGA MARK III	Ocoyoacac

State ^a	Name of facility	Location ^a
Morocco	MA-R1	Rabat, Agdal
Netherlands	HFR-Petten	Petten
	IRI. HOR	Delft
	LFR-Petten	Petten
Nigeria	NIRR-1	Ahmadu Bello University, Zaria
Norway	HBWR	Halden
	JEEP-II	Kjeller
Pakistan	PARR-1	Rawalpindi
	PARR-2	Rawalpindi
Peru	CNIP RP-10 R. Reactor	Lima
	RP-0 R. Reactor	Lima
Philippines	PRR-1	Quezon City, Diliman
Poland	Anna & Agata	Otwock-Swierk
	Maria	Otwock-Swierk
Portugal	IST - RPI	Sacavem
Romania	IFIN-HH	Magurele
	TRIGA Res.& Mtr	Pitesti-Mioveni
Serbia	RA-RB	Vinca
Slovenia	TRIGA II	Ljubljana
South Africa	Safari-I Research Reactor	Pelindaba
Sweden	Studsvik Ab and Ab Svafo	Studsvik
Switzerland	AGN 211-P	Basel
	Crocus	Lausanne
	Proteus	Wuerenlingen
Syrian Arab Republic	MNSR	
Tajikistan	Argus Research Reactor	Physical-Tech. Inst., Dushanbe
Thailand	ONRC	Ongkharak, Nakon Nayon
	TRR-1	Bangkok
Turkey	Cekmece Nuc. Res. & Tr. Centre	Istanbul
	ITU-TRR-TRIGA MARK II	Istanbul
Ukraine	IR-100 Res. Reactor	Sevastopol
	WWR-M Res. Reactor	Kiev
Uzbekistan	IIN-3M	Tashkent
	WWR-SM	Ulugbek
Venezuela	RV-1 IVIC R. Reactor	Altos De Pipe
Vietnam	Da Lat	Da Lat, Lam Dong
Conversion plants		
Algeria	Pilot Uranium Conversion Plant	Draria Nuclear Research Center
Argentina	Experimental Dry Conversion	Bariloche

State ^a	Name of facility	Location ^a
	UF ₆ Production Plant	Pilcaniyeu
	UO ₂ Conversion Plant	Cordoba
	Uranium Powder Production Fac.	Las Mesillas, La Rioja Prov.
Brazil	UOC to UF ₆ Conversion	Ipero, Sao Paulo
Canada	Blind River	Blind River, Ontario
	Port Hope	Port Hope, Ontario
Chile	Lab. Experiment. De Conversion	Santiago
Iran, Islamic Republic of	UCF	Esfahan, Iran
Japan	JCO	Tokai-Mura, Ibaraki-Ken
	PCDF	Tokai-Mura, Ibaraki-Ken
Mexico	Fuel Fabrication Pilot Plant	Salazar
Romania	Nat. Uranium Company	Feldioara
South Africa	Conversion Plant (U Plant)	Pelindaba
	HEU/LEU Conversion Plant	Pelindaba
Sweden	RMA	Stenstorp
Fuel fabrication plants		
Algeria	UDEC	Draria Nuclear Site
Argentina	Exp.Pl.Fuel Mat.& Powder Met.	Centro Atomico Constituyentes
	Fuel. Fab. Plant - Fecn	Centro Atomico Ezeiza
	Res. Reac.Fuel Elem. Fab.Plant	Centro Atomico Constituyentes
	Res.Reac. Fuel Fab. Plant	Centro Atomico Ezeiza
Belgium	FBFC Int.	Dessel
	FBFC Int.	Dessel
	N.V. BN	Dessel
Brazil	Fuel Fabrication Plant-FEC	Resende
Canada	Cameco, Port Hope	Port Hope, Ontario
	Fuel Eng. Met. Che. Op.	Chalk River, Ontario
	Fuel Fabrication Facility	Chalk River, Ontario
	GE, Hitachi Inc., Peterborough	Peterborough, Ontario
	GE, Hitachi Inc., Toronto	Toronto, Ontario
Chile	Unidad De Metalur. Fisica(Umf)	Santiago, Chile
Egypt	FMPP (Fuel Manuf. Pilot Plant)	Inshas, 35 km N/NE from Cairo
	R & D - NFL	Inshas Nucl. Res. Center, Cairo
France	Melox. Marcoule	Chusclan
Germany	Adv. Nuclear Fuels	Lingen
	Siemens Mox II	Hanau
India	NFC	Hyderabad, Andhra Pradesh
	NFC - NU	Hyderabad, Andhra Pradesh
Indonesia	IEBE	Serpong

State ^a	Name of facility	Location ^a
	IPEBRR	Serpong
Iran, Islamic Republic of	FMP	Isfahan
	FPFP	Esfahan
Italy	FN-Bosco Marengo	Bosco Marengo
Japan	GNF-J	Yokosuka-Shi, Kanagawa-Ken
	J-MOX	Oaza Obuchi, Rokkasho-Mura
	MNF	Tokai-Mura, Ibaraki-Ken
	NFI Kumatori-1	Sennan-Gun, Osaka
	NFI Tokai-1	Tokai-Mura, Ibaraki-Ken
	NFI Tokai-2	Tokai-Mura, Ibaraki-Ken
	PFPP	Tokai-Mura, Ibaraki-Ken
	PPFF	Tokai-Mura, Ibaraki-Ken
Kazakhstan	UMP	Ust-Kamenogorsk
Korea, Republic of	KNFFP	Taejon
Romania	SN NFP Subsidiary	Mioveni
South Africa	LEU Fuel Fabrication Plant	Pelindaba
	MTR Fuel Fabrication Plant	Pelindaba
Spain	ENUSA Fab. Juzbado	Juzbado
Sweden	Westinghouse Electric	Vaesteras/Finnslaetten
Turkey	Nuclear Fuel Pilot Plant	Istanbul
Ukraine	NFFP	Smolino Village, Kirovograd Re
Reprocessing plants		
Egypt	Hydrometallurgy Unit	Inshas, Cairo
France	AREVA NC - UP2 et UP3	La Hague
Germany	WAK / VEK	Eggenstein-Leopoldshafen
India	PREFRE	Tarapur, Mumbai, Maharashtra
Iran, Islamic Republic of	Mix Facility	End of North Karegar in Tehran
Italy	So.G.I.N. Spa - Impianto Eurex	Saluggia
	So.G.I.N. Spa - Trisaia	Rotondella
Japan	CPF	Tokai-Mura, Ibaraki-Ken
	RETF	Tokai-Mura, Ibaraki-Ken
	RRF	Ibaraki-Ken
	RRP	Kamikita-Gun, Aomori-Ken
	SCF	Tokai-Mura, Ibaraki-Ken
	TRP	Tokai-Mura, Ibaraki-Ken
Enrichment plants		
Argentina	Mock-Up Laboratory	Pilcaniyeu
	Mol Exc & Iso-Sep Tech R&D Lab	Centro Atomico Bariloche
	Uranium Enrichment Plant	Pilcaniyeu

State ^a	Name of facility	Location ^a
Australia	Silex	
Brazil	Isotopic Enrich.Lab.(LEI)	Ipero, Sao Paulo
	Laser Spectroscop.Lab.(AR/LAS)	San Jose Dos Campos
	U-235 Centrifuge Enr. Plant	Resende
	Uran.Enrich.Pilot Plant(USIDE)	Ipero, Sao Paulo, Brazil
China	Shaanxi	Han Zhang, Shaanxi Province
France	Georges Besse II	Bollene
Germany	UTA 1 and UTA 2	Gronau
Iran, Islamic Republic of	FEP	Natanz
	FFEP	20 km northeast of Qom City
	PFEP	Natanz
Japan	CTF	Kitakami-Gun , Aomori-Ken
	NEP	Tomata-Gun, Okayama-Ken
	REP	Kamikita-Gun, Aomori-Ken
Netherlands	Urenco Nederland	Almelo
United Kingdom	Urenco E22, E23, A3	Capenhurst
Separate storage facilities		
Argentina	Cent.St.Irr.Sp.Fiss.M.(DCMFEI)	Centro Atomico Ezeiza
	Cent.Store Sp.Fiss.Mat.(DCMFE)	Centro Atomico Constituyentes
	DUE	Centro Atomico De Ezeiza
	Irrad. Res. React. Fuel Store.	Centro Atomico Ezeiza
	Nuclear Material Storage	Centro Atomico Constituyentes
	Storage Bunker	Centro Atomico Ezeiza
Armenia	SSFS	Metsamor
Australia	Bulk Storage Facility	Lucas Heights, Sutherland
Belgium	Belgoprocess	Dessel
	Belgoprocess	Dessel
	Belgoprocess UF6	Dessel
	Elbel. DL. DS	Beveren
	Wet Store	Tihange
Brazil	Aramar Store	Ipero
	Planned Fuel Storage Facility	Ilha Da Madeira, Itaguaí
Bulgaria	DSFSF KNPP 2	Kozloduy
	SFSF Kozloduy 1	Kozloduy
Canada	ACEL Research	Pinawa, Manitoba
	DP Dry Storage	Tiverton, Ontario
	DWMF	Darlington, Ontario
	FPSF	Chalk River Laboratories, Ontario
	Gentilly I	Gentilly, Quebec

State ^a	Name of facility	Location ^a
	NMSF	Chalk River, Ontario
	PUFDSF	Pickering, Ontario
	Spent Fuel Canister Storage	Chalk River, Ontario
	Waste Storage Facility	Chalk River, Ontario
	Waste Storage Facility	Chalk River, Ontario
	WUFDSF	Tiverton, Ontario
Czech Republic	ISFS Dukovany	Dukovany
	ISFS Temlin	Temelin
	Radioactive Waste Rep. Richard	Litomerice
	VAO, HLWS	Řež
Denmark	DD Storage	Roskilde
	DD Waste	Roskilde
Finland	SF Repository	Olkiluoto
	TVO-KPA-Store	Olkiluoto
Germany	AVR-BL	Juelich
	BZA Ahaus	Ahaus
	EWN. ZLN	Lubmin
	HDB	Eggenstein-Leopoldshafen
	Kernmateriallager 87	Rosendorf
	KFA-AVR	Juelich
	KFK-FR-2	Eggenstein-Leopoldshafen
	NCS-Lagerhalle	Hanau
	PTB-Spaltstofflager	Hanau
	SZK Krümmel	Geesthacht
	SZL Biblis	Biblis
	SZL Brokdorf	Brokdorf
	SZL Brunsbüttel	Brunsbüttel
	SZL Emsland	Lingen (Ems)
	SZL Grafenrheinfeld	Grafenrheinfeld
	SZL Grohnde	Emmerthal
	SZL Gundremmingen	Gundremmingen
	SZL Isar	Essenbach
	SZL Neckarwestheim	Neckarwestheim
	SZL Philippsburg	Philippsburg
	SZL Unterweser	Stadland
	TBH (B) 87.2	Rosendorf
	TBL-G	Gorleben
	Uranoxid-Lager Uag	Gronau
Hungary	Cent. Isotope Store	Budapest

State ^a	Name of facility	Location ^a
	MVDS	Paks
	RWTDF	Puspokszilagy
India	TAPS AFR	Tarapur, Mumbai, Maharashtra
Indonesia	Ria-nd ISFSF	Serpong
Iran, Islamic Republic of	KWS	Karaj
Iraq	Tuwaittha Location C	Tuwaittha
Italy	CCRM-Ispra Cent. Store	Ispra
	Centro Di Comune Di Ricerca	Ispra
	Dep. Avogadro	Torino
	Essor Storage	Ispra
	Lab.Misure Nucleari Perla	Ispra
	Nucleco S.P.A.	Rome
Japan	Fugen	Tsuruga-Shi, Fukui-Ken
	Fuku-I-CSFS	Futaba-Gun, Fukushima-Ken
	JAERI Mutsu	Mutsu-Shi, Aomori-Ken
	KUFFS	Sennan-Gun, Osaka
	NFI Kumatori-2	Sennan-Gun, Osaka
	Ningyo R & D	Tomata-Gun, Okayama-Ken
	RFSC	Mutsu-Shi, Aomori-Ken
Kazakhstan	Baikal-1 DSFS	Kurchatov
	BN-350 Temp. Storage	Aktau
	Ulba Thorium Storage	Ust-Kamenogorsk
Korea, Republic of	Acrylonitrile Plant	Ulsan
	NMSF	Kaeri Site In Taejon
	Uranium Residue Storage Fac.	Kaeri-Daejeon
Lithuania	Radioactive Waste Management	Vilnius
	SNFS-1	Visaginas
	SNFS-2	Visaginas
Netherlands	COVRA	Vlissingen-Oost
	HABOG	Vlissingen
Poland	ZUOP	Swierk
Portugal	IST Instalacao Piloto	Sacavem
Romania	CNE Cernavoda IDSFS	Cernavoda
Russian Federation	IUEC Storage Facility	Angarsk
Slovakia	Javys ISFS	Jaslovske Bohunice
	Javys Nuclear Store	Jaslovske Bohunice
South Africa	Bulk Storage Facility	Pelindaba
	E-Building	Valindaba
	HEU Storage Vault	Pelindaba

State ^a	Name of facility	Location ^a
	Koeberg Castor Storage Fac.	Cape Town
	Thabana Pipe Store	Pelindaba
	Waste Storage Facility	Pelindaba
	Y-Plant Storage Facility	Pelindaba
	Z-Plant	Pelindaba
Spain	Asco ATI	Asco
	ATI	Almonacid De Zorita
	CN Trillo	Trillo
Sweden	SFK	Oesthammar
	SKB Clab Store	Oskarshamn
Switzerland	Saphir	P. Sherrer Institute (PSI) Wuerenlin
	Zwibez Kernkraftwerk Beznau	Kernkraftwerk Beznau
	Zwilag	Wuerenlingen Aargau
United States of America	KAMS Storage	Savannah River Site
Ukraine	Chernobyl NPP-SFS	Chernobyl
	Chernobyl SNFSF-2	Chernobyl
	Khmelnitski FF Storage	Neteshin
	Rovno FF Storage	Kuznetsovsk
	Sth. Ukraine FF Storage	Yuzhnoukrainsk
	Ukraine Centralized Dry Store	Chernobyl Exclusion Zone
	Zaporozhe FF Storage	Energodar
	Zaporozhe SFS	Energodar
United Kingdom	SMP Export Facility	Sellafield
	SNM Store 9	Sellafield
	THORP Product Store	Sellafield
Other facilities		
Algeria	AURES I	Birine Nucl.Site (Ain Oussara)
Argentina	Alpha Laboratory	Centro Atomico Constituyentes
	Enriched Uranium Recovery Lab.	Centro Atomico Ezeiza
	Fission Products Division	Centro Atomico Ezeiza
	Lapep	Centro Atomico Ezeiza
	Triple Altura Laboratory (LTA)	Centro Atomico Ezeiza
	Uranium Powder Fab. Plant	Centro Atomico Constituyentes
Australia	R & D Labs	Lucas Heights, Sutherland
Belgium	Belgoprocess	Mol
	I.R.E.	Fleurus
	IRMM.Geel	Geel
	SCK-CEN Lab.	Mol
	SCK-CEN Pu Laboratories	Mol

State ^a	Name of facility	Location ^a
Brazil	(Ladesi)-Copesp	Sao Paulo
	Fuel Development & Tech. Fac.	Sao Paolo, Brazil
	Labgene	Ipero, Aramar, Sao Paulo, Br
	Nuc. Fuel & Instr. Devel. Lab.	Sao Paulo
	Nuclear Mat. Lab.-Labmat	Ipero
	Reprocess.Proj.(IPEN-CNEN/SP)	Sao Paulo
Czech Republic	Lab. & Stores, Centr. Anal.Lab	Rez
	UJP	Prague
Denmark	Danish Decommiss. - Hotcell	Roskilde
Egypt	Molybdenum Production Unit	Inshas, Cairo
	NCB	Inshas
Georgia	Razmnozhitel-1	Tbilisi
	Sukhumi Inst.	Sukhumi
Germany	Inst. Kernchemie	Mainz
	JRC-ITU	Eggenstein-Leopoldshafen
	KFA-HZ	Juelich
	Lab. Juelich	Juelich
	PKA Gorleben	Gorleben
	WAK-Heisse Zellen der HVT	Eggenstein-Leopoldshafen
Indonesia	RMI	Serpong
Iran, Islamic Republic of	JHL	Tehran Nucl. Res Center, Tehran
Italy	CNEN-ISTEC	Santa Maria Di Galeria
	Impianto Plutonio	Santa Maria Di Galeria
	OPEC 2-CAS	Santa Maria Di Galeria
Japan	NC Tokai R & D	Tokai-Mura, Ibaraki-Ken
	FMF	Higashi, Ibaraki-Ken
	IRAF	Higashi-Gun, Ibaraki-Ken
	JAERI Oarai R & D	Higashi, Ibaraki-Ken
	JAERI Tokai	Tokai-Mura, Ibaraki-Ken
	JNC Oarai R & D	Higashi, Ibaraki-Ken
	Kumatori	Sennan-Gun, Osaka
	Mitsui Iwakuni-Ohtake	Kuga-Gun, Yamaguchi-Ken
	Mitsui Osaka	Takai-Shi, Osaka-Fu
	NDC Fuel Hot Lab	Tokai-Mura, Ibaraki-Ken
	NERL	Tokai-Mura, Ibaraki-Ken
	NFD	Higashi, Ibaraki-Ken
	NRF	Tsukuba-Shi, Ibaraki-Ken
	Showa	Kawasaki-Shi, Kanagawa-Ken
	Sumitomo-Chiba	Sodegaura-Shi, Chiba-Ken

State ^a	Name of facility	Location ^a
	UML	Higashi, Ibaraki-Ken
Korea, Republic of	ACPF	At Kaeri site, Daejon
	DFDF	Taejon
	HFFL	Taejon
	IMEF	Taejon
	KAERI R&D Facility	Taejon
	PIEF	Taejon
	PRIDE	Kaeri-Daejeon
Libya	Tajura Uranium R&D Facility	Tajura
Netherlands	GCO/ECN Lab.	Petten
Norway	Research Laboratories	Kjeller
South Africa	Decontam. & Waste Recovery Pl.	Pelindaba
	Hot Cell Complex	Pelindaba
	Nu And Du Metals Plant	Pelindaba
Spain	C.A. El Cabril	El Cabril
Switzerland	CERN	Switzerland
	E.I.R.	Wuerenlingen
Ukraine	Chernobyl Conditioning	Chernobyl
	Chernobyl Unit 4 Shelter	Chernobyl
	KHFTI	Kharkov
	Sevastopol Subcritical Assy.	Sevastopol

^a An entry in this column does not imply the expression of any opinion whatsoever on the part of the Agency concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

Note: The Agency was also applying safeguards at 17 facilities in Taiwan, China.

Additionally under Agency safeguards were 622 material balance areas containing locations outside facilities (LOFs) in 112 States and in Taiwan, China.