

CAPACITY BUILDING FOR RESPONSIBLE DEVELOPMENT OF NUCLEAR ENERGY

Dr. Alex R. Burkart

Senior Level Advisor for Nuclear Energy
U.S. Department of State

U.S. Side Event at the NPT PrepCom
IAEA Headquarters, Vienna, Austria
May 8, 2017

The Three Parts of the Challenge for the Responsible Development of Nuclear Power



Nuclear Proliferation



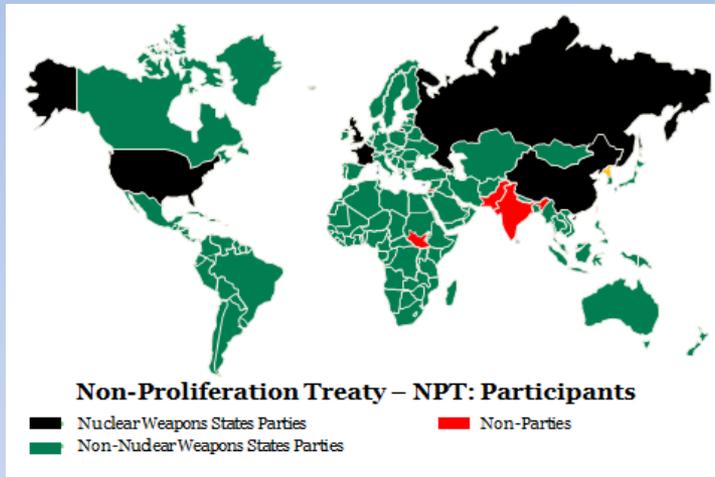
Nuclear Safety



Nuclear Security

“the use of nuclear power must be accompanied at all stages by **commitments** to and ongoing **implementation** of the highest standards of **safety** and **security** throughout the life of the power plants, and effective **safeguards**” (IAEA GC(60)/RES/12)

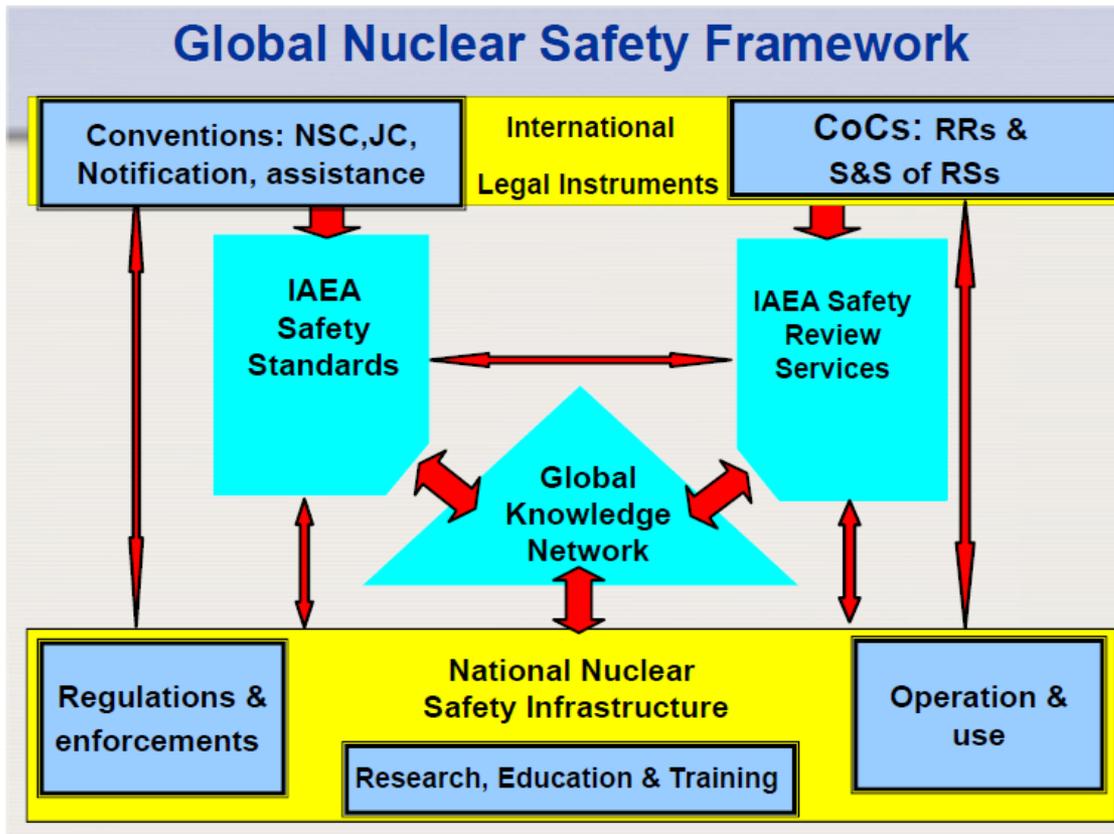
Tangible Commitments to High Standards: Nonproliferation



- Treaty on the Non-Proliferation of Nuclear Weapons
- IAEA Comprehensive Safeguards (INFCIRC/153)
- IAEA Additional Protocol (INFCIRC/540)
- Nuclear Export Control Regimes (NSG and Zangger)



Tangible Commitments to High Standards: Nuclear Safety

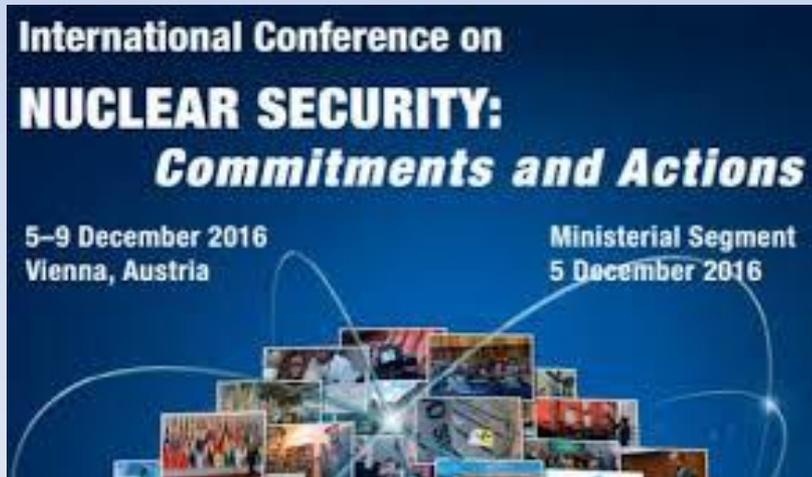


- Convention on Nuclear Safety
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- Nuclear Liability Conventions
- IAEA Safety Standards

Tangible Commitments to High Standards: Nuclear Security



- International Convention for the Suppression of Acts of Nuclear Terrorism (NTC)
- Convention on the Physical Protection of Nuclear Material (CPPNM)
- 2005 Amendment to the CPPNM
- IAEA Nuclear Security Guidance
- IAEA Nuclear Security Conference - 2016



Sound Infrastructure is Key to Implementing Commitments

The IAEA Milestones Approach

- **Milestone 1: Knowledgeable Commitment**
- **Milestone 2: Invitation for Bids**
- **Milestone 3: Ready to Commission and Operate**

National Position

Nuclear Safety

Management

Funding and Financing

Legislative Framework

Safeguards

Regulatory Framework

Radiation Protection

Electrical Grid

Human Resource Development

Stakeholder Involvement

Site and Supporting Facilities

Environmental Protection

Emergency Planning

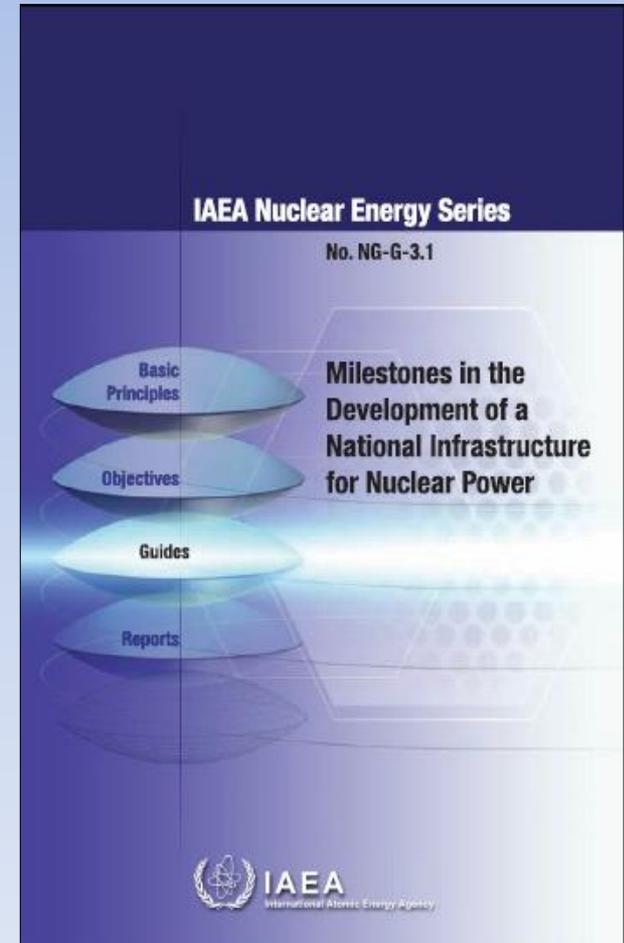
Security and Physical Protection

Nuclear Fuel Cycle

Radioactive Waste

Industrial Involvement

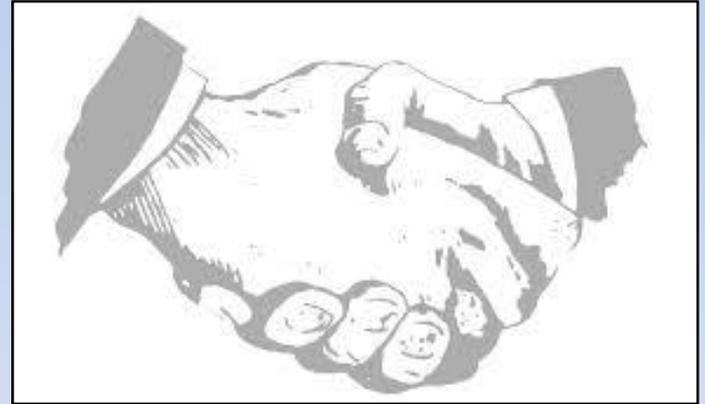
Procurement



The Case for Cooperation in Nuclear Power Development

Countries have much to gain from cooperation

- Multilateral organizations offer comprehensive, impartial guidance and assistance
- Governments can share best practices and lessons learned
- Educational Institutions can develop human resources
- Industry can supply “hardware” and “software”
 - Nuclear technology, expert advice, training



Almost Nobody Does it Alone

Cooperation With the United States:



Supports State Pursuit of the Milestones Approach



**Nuclear Cooperation Agreements
Partnership for Nuclear Security
Export Control and Related Border Security Program**



Nuclear Research, Development and Deployment



**Safeguards Engagement, Security, Export Control and
Emergency Management**



International Nuclear Regulatory Partnerships



Nuclear Engineering Education at U.S. Universities

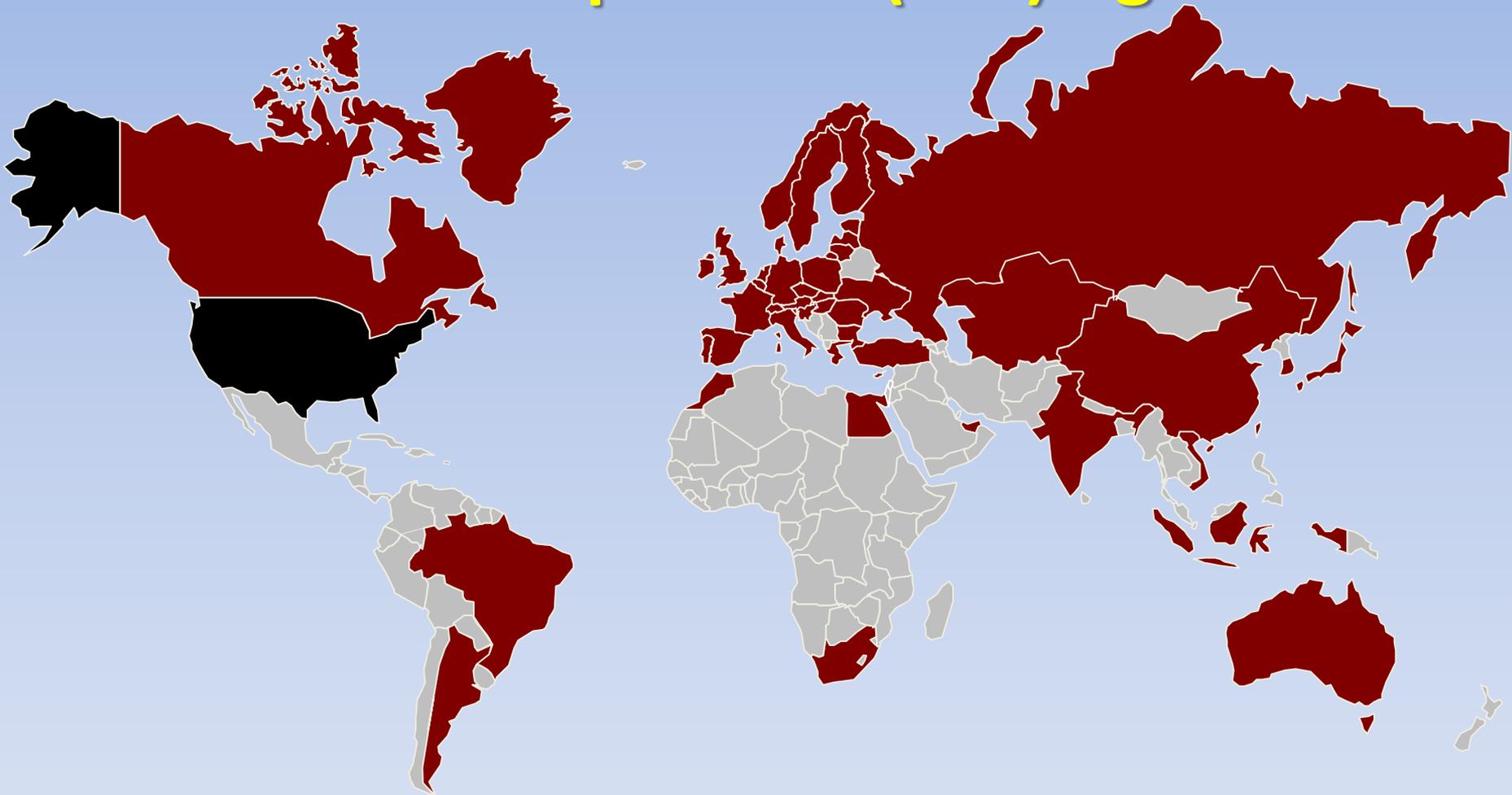


**IAEA Technical Cooperation and the
Peaceful Uses Initiative**



**International Framework on
Nuclear Energy Cooperation**

U.S. Nuclear Cooperation (123) Agreements



- Establishes agreed conditions for U.S. export of nuclear material, reactors, and equipment
- Exports of material, equipment or technology are licensed or authorized by DOE, NRC or DOC
- Supplemented by numerous international arrangements for bilateral cooperation



Partnership for Nuclear Security (PNS)

- PNS seeks to establish a **self-sufficient nuclear security culture, ingrained** in partner countries' nuclear **technical community**.
- PNS joins with nuclear **scientists, technicians, engineers** (STEs) and **academics** to promote technical cooperation and enhance nuclear security and related safety best practices.
- **PNS activities include:**
 - Insider Threat Mitigation and Trustworthiness Programs
 - Applied Nuclear Security Culture for STEs
 - Nuclear Security Trainings for Technical Workforce



Partners

**Algeria Brazil Indonesia
Jordan Libya Morocco
Nigeria Saudi Arabia
South Africa UAE**



Research Development and Deployment



Nuclear Infrastructure

Nuclear Technology Research and Development

Nuclear Technology Demonstration and Deployment

Spent Fuel and Waste Disposition

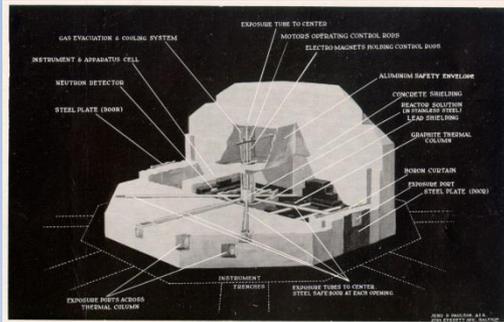
**A Robust RD&D Program Supports U.S.
International Policy Objectives**



U.S. Nuclear Engineering Education: Partnering with the World

The Beginning:

**NCSU R-1
Reactor
1953-1955**



Today:

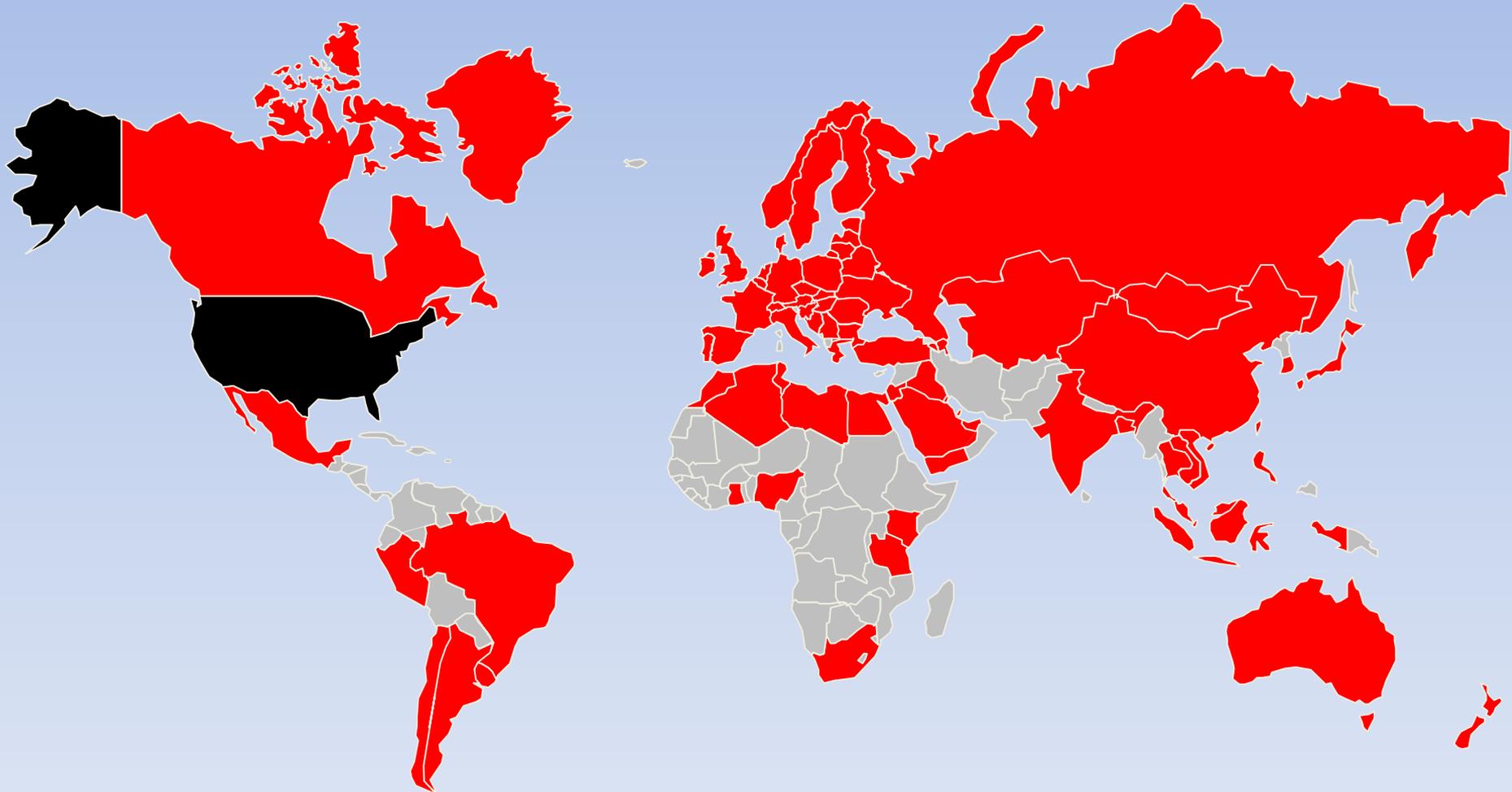
100 nuclear engineering / engineering related programs at universities

- **Nuclear physics, nuclear engineering**
- **Medical / health physics etc.**
- **25 universities have a research reactor**
- **20 universities have a particle accelerator**
- **~400 current foreign undergraduate and graduate students – financial support is available**

| Air Force Institute of Technology | University of California, Berkeley |
|---|---|
| Clemson University | University of Cincinnati |
| Colorado School of Mines | University of Florida |
| Georgia Tech University | University of Idaho |
| Idaho State University | University of Illinois at Urbana –Champaign |
| Kansas State University | University of Maryland |
| Louisiana State University | University of Massachusetts Lowell |
| Massachusetts Institute of Technology | University of Michigan |
| Missouri of Science & Technology | University of Missouri |
| North Carolina State University | University of Nevada, Las Vegas |
| Ohio State University | University of New Mexico |
| Oregon State | University of North Texas |
| Penn State | University of Pittsburg |
| Purdue University | University of South Carolina |
| Rensselaer Polytechnic Institute | University of Tennessee |
| South Carolina State University | University of Texas |
| Texas A&M University | University of Texas of the Permian Basin |
| Three Rivers Community College | University of Utah |
| United States Military Academy - West Point | University of Wisconsin – Madison |
| University of Arizona | Virginia Commonwealth University |
| | Virginia Tech |



U.S. International Partners in Bilateral Programs



This assistance is not limited to countries that have commercial contracts with U.S. companies.

Multilateral Nuclear Cooperation



IFNEC

The International Framework For Nuclear Energy Cooperation

www.ifnec.org



IAEA

International Atomic Energy Agency

www.iaea.org

NSG



Nuclear Suppliers Group

www.nuclearsuppliersgroup.org



**WORLD INSTITUTE FOR
NUCLEAR SECURITY**

www.wins.org



NEA

NUCLEAR ENERGY AGENCY

www.oecd-nea.org



European
Commission

EURATOM

www.euratom.org



W A N O

**World Association
of Nuclear
Operators**

www.wano.info

**GEN IV International
ForumSM**



www.gen-4.org



IAEA

International Atomic Energy Agency

Atoms For Peace

The IAEA

“Atoms for Peace”



“The more important responsibility of this [international] Atomic Energy Agency would be to devise methods where by this fissionable material would be allocated to serve the peaceful pursuits of mankind. Experts would be mobilized to apply atomic energy to the needs of agriculture, medicine, and other peaceful activities. A special purpose would be to provide abundant electrical energy in the power-starved areas of the world.”

U.S. Extrabudgetary Support

- The largest single contributor to the Technical Cooperation Fund: over \$23.1M for 2017 (planned)
- Peaceful Uses Initiative: \$72.6M since 2010
- Renovation of Nuclear Applications Laboratories (ReNuAL): \$9.4 million
- Zika: \$5 million
- Ebola: \$1 million
- Additional Extra-budgetary Support towards Training, Fellowships, and Cost-Free Experts
- Total Planned 2017 U.S. Extrabudgetary Contributions to IAEA, Including Safety, Security, Safeguards, JCPOA, and Peaceful Uses: \$89.8M



PUI Projects in Infrastructure Development



- **16 Inter-regional projects involving topics such as:**
 - Legislative framework for nuclear power
 - Human resource development
 - Site survey and evaluation
 - Small Modular Reactors
 - Knowledgeable decisionmaking
 - Safety culture

- **Eight Regional projects involving topics such as:**
 - Energy planning
 - Human resource development
 - Support to knowledgeable decisionmaking
 - Sustainability of programme activities

- **15 National projects involving topics such as**
 - Infrastructure for construction and operation of a nuclear power plant
 - Building capability for nuclear power plant planning
 - Developing Capacities in Pre-Project Activities
 - Legal and regulatory framework

U.S. PUI Contribution for Infrastructure Development >\$20M



U.S. Sponsored IAEA Training in Infrastructure Development – 2014-2016

- **Training Courses at Argonne National Laboratory, involving nearly 100 participants from 32 countries on topics such as:**
 - **Leadership and Management for Introducing and Expanding Nuclear Power Programmes**
 - **Legal and Financial Issues for Introducing or Expanding Nuclear Power**
 - **Integrated Management Systems and Developing of the Safety Culture**
 - **Developing Human Resources, Institutional Capacity and the Legal and Regulatory Framework**

- **Group Fellowships at Texas A&M, U. Mass, Lowell, MIT, University of Texas and others involving approximately 175 participants from 34 countries focused heavily on human resource development**

- **Individual Fellowships involving over thirty individuals from 16 countries at DOE, NRC and other organizations for specialized training**



U.S. Sponsored IAEA Training: Non-Infrastructure - 2014-2016

➤ Training Courses

- **Medical**

- One at Argonne National Laboratory, involving 15 participants from 14 countries
- Three at the University of Texas, M.D. Anderson Cancer Center, involving 56 participants from 41 countries
- One at Centers for Disease Control and Prevention (CDC), involving 13 participants from 13 countries

- **Environment**

- Three at Argonne National Laboratory, involving 61 participants from 44 countries

- **Agriculture**

- One at Argonne National Laboratory, involving 10 participants from 6 countries

➤ Group Fellowships

- **Medical**

- One at Argonne National Laboratory, involving 12 participants from 11 countries
- Two at the University of Texas, M.D. Anderson Cancer Center, involving 53 participants from 43 countries



IFNEC Statement of Mission

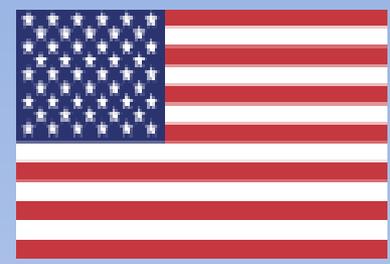
“The International Framework for Nuclear Energy Cooperation provides a forum for cooperation among participating states to explore mutually beneficial approaches to **ensure the use of nuclear energy for peaceful purposes proceeds in a manner that is efficient and meets the highest standards of safety, security and non-proliferation.** Participating states would not give up any rights and voluntarily engage to share the effort and gain the benefits of economical, peaceful nuclear energy.”





The Work of IFNEC is Performed Through its Working Groups

- **Infrastructure Development Working Group (IDWG)** supports the development of the infrastructure needed to ensure that the use of nuclear energy for peaceful purposes proceeds in a manner that is efficient and meets the highest standards of safety, security and non-proliferation. Particular areas of emphasis are: **human resource development; radioactive waste management**, including infrastructure Issues for a multinational spent fuel repository; **small modular reactors; stakeholder involvement** and public acceptance; **nuclear safety; nuclear security**; and **emergency preparedness and response**.
- **Reliable Nuclear Fuel Services Working Group (RNFSWG)** supports the co-operation of member countries in efforts that enhance reliable, commercially-based fuel services that provide options for developing nuclear energy while reducing the risk of nuclear proliferation. The focus of the work has been on the back end of the fuel cycle **exploring the issues associated with spent fuel management and disposition**. These efforts include furthering the **potential for shared, multinational solutions** to the back end challenges facing member countries.



CAPACITY BUILDING FOR RESPONSIBLE DEVELOPMENT OF NUCLEAR ENERGY

Thank You for Your Attention

For further information, contact Dr. Alex R. Burkart at:

burkartar@state.gov