

Radiation Safety Information Computational Center (RSICC)

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Nuclear Data Evaluations for Reactor
Applications

ORNL is managed by UT-Battelle, LLC for the US Department of Energy

Radiation Safety Information Computational Center (RSICC)

Mission:

Serve as a unique nuclear software and data center for government agencies, universities and private industry by providing a centralized resource for quality-controlled modeling and simulation tools, processed nuclear data, and evaluated experimental benchmarks

Strategy:

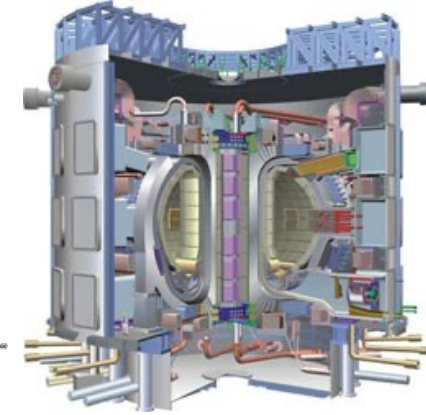
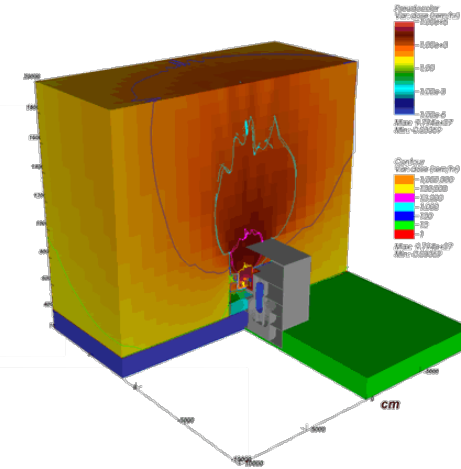
Engage domestic and international efforts that develop advanced M&S tools, evaluated nuclear data and benchmark experiments to make them available to our customers

Statistics:

Over 2,000 packages in the RSICC collection
Nearly 4,000 packages distributed annually
15,000+ active customers from 100+ countries
Operate secure CLOUD server to support international collaborations, e.g., ITER

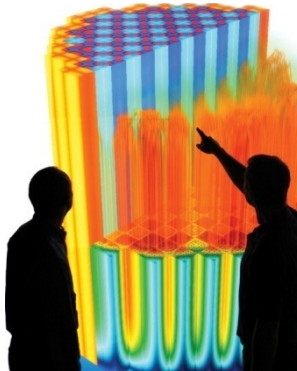
Major sponsors:

NNSA Nuclear Criticality Safety Program, NNSA Non-Proliferation R&D, DOE Office of Nuclear Energy, Nuclear Regulatory Commission, NNSA Naval Reactors, DOE Office of Science

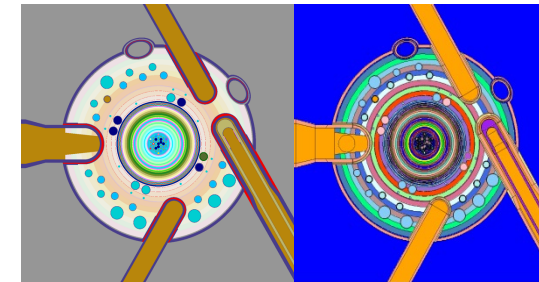


Radiation Source Terms

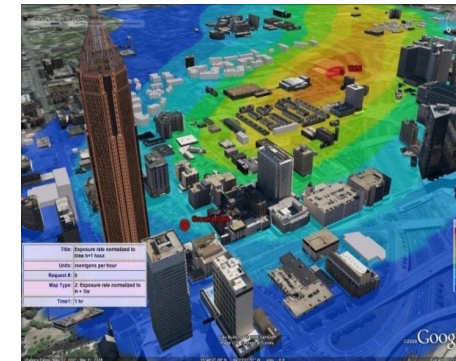
Fusion



Advanced Reactors



Nuclear Criticality Safety



Nuclear Security Modeling

RSICC is a specialized information analysis center that collects, archives, and disseminates software and data for applications in nuclear science and technology

- RSICC's operations include various activities
 - Software Packaging and Quality Assurance
 - Customer Registration
 - Customer Request Processing
 - Website Maintenance and Updates
 - Software Exchanges with International Organizations
 - Production of monthly Newsletter
 - *Secure CLOUD operations*
- Records retention is a key aspect of RSICC's operations to allow the Federal government to monitor the use of U.S. nuclear technology



Export Control Responsibilities

Why is the export of nuclear modeling codes controlled?

U.S. export control regulations exist to balance the competing interest for U.S. competitiveness with U.S. national security concerns.

The U.S. Federal Government is committed to preventing the proliferation of nuclear weapons and ensuring the safe and secure deployment of nuclear technology for peaceful purposes

- Nuclear modeling and simulation tools (M&S) are enabling technologies that have dual uses in the design, development and analysis of nuclear technology across a broad range of applications for both peaceful and military purposes

RSICC's distribution of nuclear M&S tools falls under the regulation of the U.S. Federal Government

- **Department of Commerce: Bureau of Industry and Security (BIS)**
 - 15 CFR Parts 730-774 [dual use technology, Export Administrations Regulations (EAR)]
- **Department of Energy**
 - 10 CFR 810 (basis Atomic Energy Act of 1954) [technical assistance use and/or development]
- **Department of State: Directorate of Defense Trade Controls (DDTC)**
 - 22 CFR Parts 120-130 [International Traffic in Arms Regulations (ITAR) - Military items including nuclear weapons]
 - Nonproliferation based sanctions
- **Department of Treasury: Office of Foreign Assets Control (OFAC)**
 - Sanctions based controls: Cuba, Iran, North Korea, Syria, organizations, persons, etc.
- *Under all regulations citizenship(s) and location of the end user determines export regime and approval*
- MCNP®, SCALE, SOCKEYE, and RELAP and variants of these codes are controlled by 10 CFR 810

Department of Energy:

- Nuclear technology and technical assistance (directly or indirectly) in the development or production of any special nuclear material outside of the United States
- DOE has statutory responsibility for authorizing the transfer of nuclear technology, **including software**, and assistance to foreign atomic energy activities within the U.S. or abroad
 - Software is considered an enabling technology that can aid in proliferation activities
- Generally authorized activities with countries listed in Appendix A of 10 CFR 810 that do not involve sensitive nuclear technology
- Codes regulated by the NNSA: MCNP®, RELAP, SOCKEYE, and any variant of these codes
- The export of software to non-Appendix A countries or their citizens requires a specific authorization
 - RSICC's secure cloud server as a pathway to address access concerns

Single User License Agreement

- Single User License Agreement
 - Restricts software to only be used by the Licensee
 - Restricts Licensee from redistributing the software or variants of the software to others
 - License is only valid while the individual is associated with the organization identified on the license agreement and for the approved end use
 - *Some end uses are not permissible under U.S. Federal regulations*
 - Licenses have always been linked with the customer's organization, location and end use – whether implicit, prior to Feb. 2015, or explicit, after Feb. 2015
 - RSICC is required to screen all organizations against denied parties list maintained by the Federal government to ensure compliance with U.S. export control regulations by the DOC, DOE, DOT, etc.
 - RSICC is required to review all end uses as not all end uses are permissible even if individuals are physically located and working in the U.S.
 - Prior licensing records have been utilized in several U.S. Federal government investigations of RSICC's customers including those by the DOE Inspector General, the FBI, and the U.S. Attorney General's Office

Export Control Agreements

- Export Control Agreement
 - Restricts re-export of the software to other locations
 - Restricts use of the software for military or defense purposes unless authorized and approved by the U.S. Government for persons physically located in the U.S.
 - Requires the Licensee to assert that they are not identified on any denied person's list or a citizen of a country identified on a parties' lists
 - Identifies the export control jurisdictions for the software
 - Not all end uses are permissible even if the individual is in the U.S. and working for a U.S. organization per U.S. Code of Federal regulations (10 CFR 810)
 - A specific authorization by the U.S. Secretary of Energy is required for engaging in or providing technology for activities listed in 10 CFR 810 (810.7(C)) to foreign persons.
 - Uranium isotope separation (enrichment), plutonium isotope separation, etc.
 - Fabrication of nuclear fuel containing plutonium
 - Heavy water production
 - Development, production or use of a “production” accelerator-driven subcritical assembly (an accelerator driven system for production of weapons grade materials)
 - Development, production or use of a “production” reactor
 - Reprocessing of irradiated nuclear fuel or targets containing special nuclear material

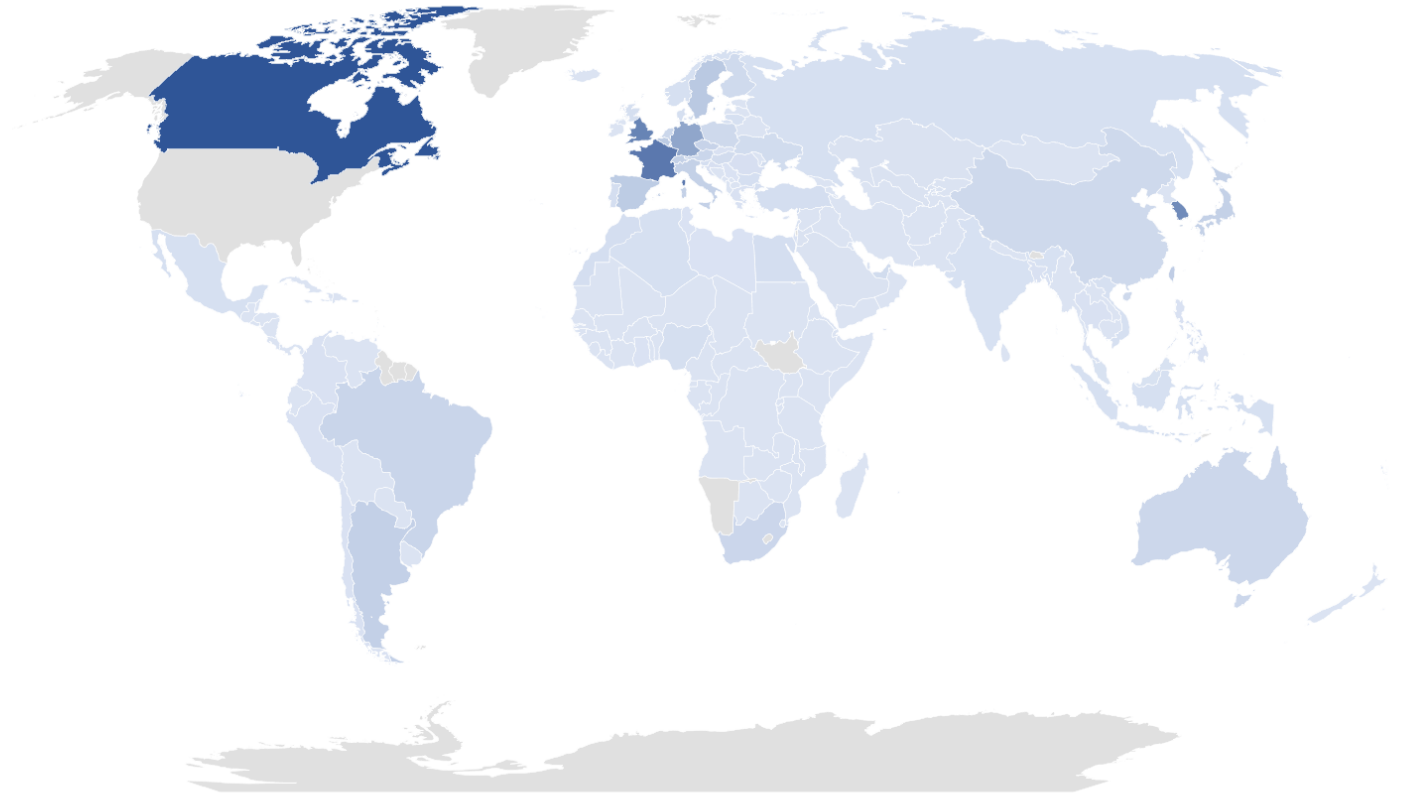
RSICC Cost Recovery

- Customers supported by RSICC's sponsors do not pay the cost recovery fee
 - Researchers supported by RSICC's sponsors (some DOE-NE program offices, NA-22, Naval Reactors, Fusion, etc.)
 - NRC staff as approved by NRC Program Manager
 - Individuals performing criticality safety analyses for U.S. government
- Universities
 - Prior to 2010 all university programs had to pay a cost recovery fee
 - From 2010 to 2013 cost recovery fee was only waived for select nuclear engineering departments
 - After January 2013 cost recovery fee waived for all nuclear engineering departments and programs at U.S. universities
- In 2020, RSICC's sponsors mandated full cost recovery for those not supported by them as they did not want to be subsidizing the cost of services to the general public or private organizations
- Historically cost recovery fee varied based on number of requests, center's costs of operations, and funding support from Federal government and others
 - FY2003: \$1,000 for DOE labs and universities, \$1,150 general public, and \$1,300 foreign
 - FY2020: \$1,000 general approval, \$1,250 Federal approval, \$1,823.30 CLOUD approval
 - FY2021 – FY2023: \$950 general approval, \$1,188 Federal approval, \$1,746 CLOUD approval
- There are NO fees for those serving only as system administrators
 - Installation of RSICC software on a server/cluster requires that all system administrators be licensed as not all persons can be provided ACCESS to the software that we distribute (citizenship based)

RSICC's customers and software distribution

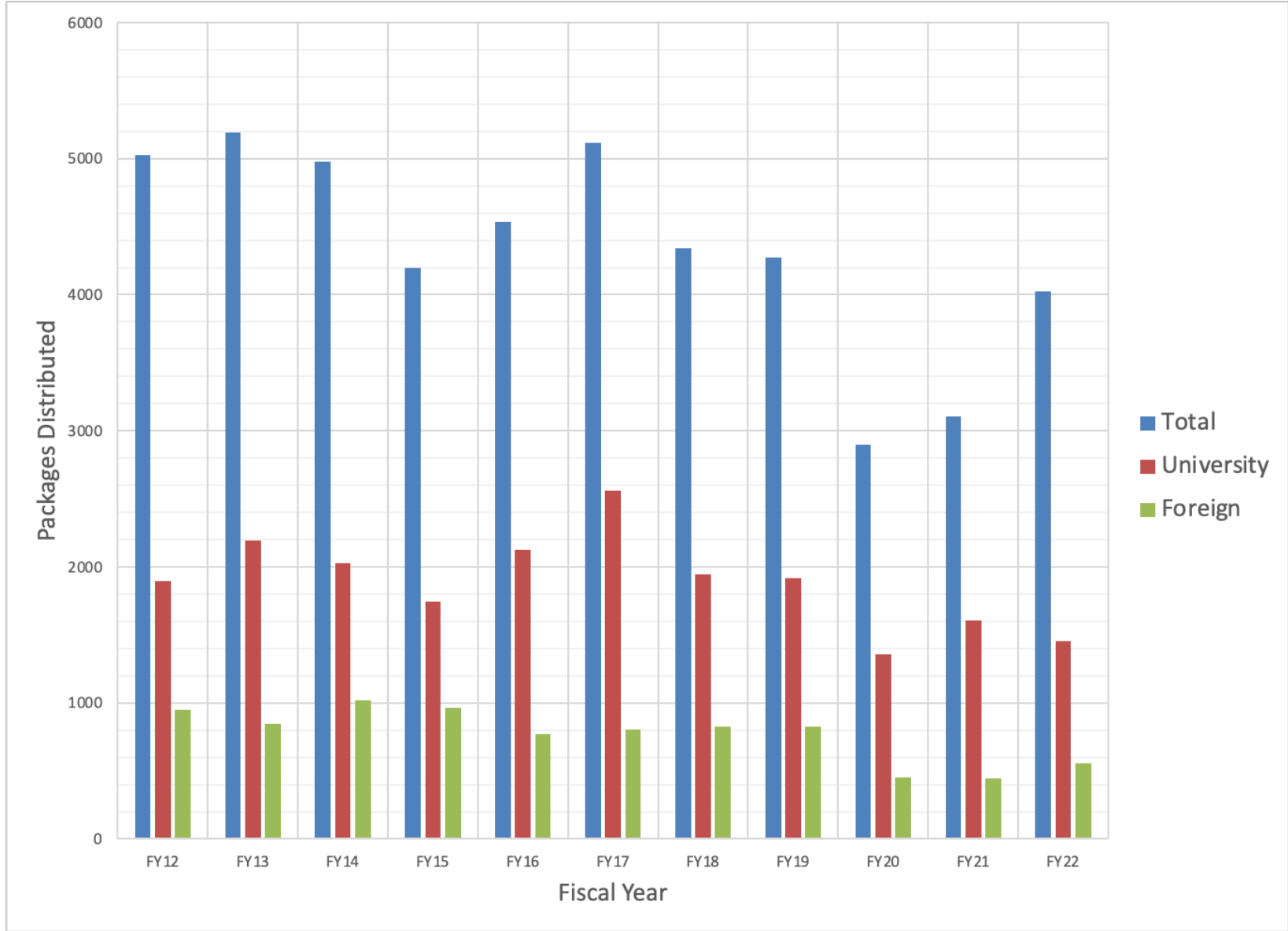
RSICC Package Distribution over the Past Decade

Country Name	Packages
UNITED STATES	44381
CANADA	1746
FRANCE	1211
ENGLAND	1072
SOUTH KOREA	989
GERMANY	694
SWEDEN	299
BELGIUM	263
SPAIN	258
TAIWAN	251
JAPAN	236
ARGENTINA	222
SWITZERLAND	213
ITALY	206
CZECH REPUBLIC	183
BRAZIL	170
AUSTRIA	152
SOUTH AFRICA	150
CHINA	146
THE NETHERLANDS	139
AUSTRALIA	133
POLAND	115
FINLAND	101

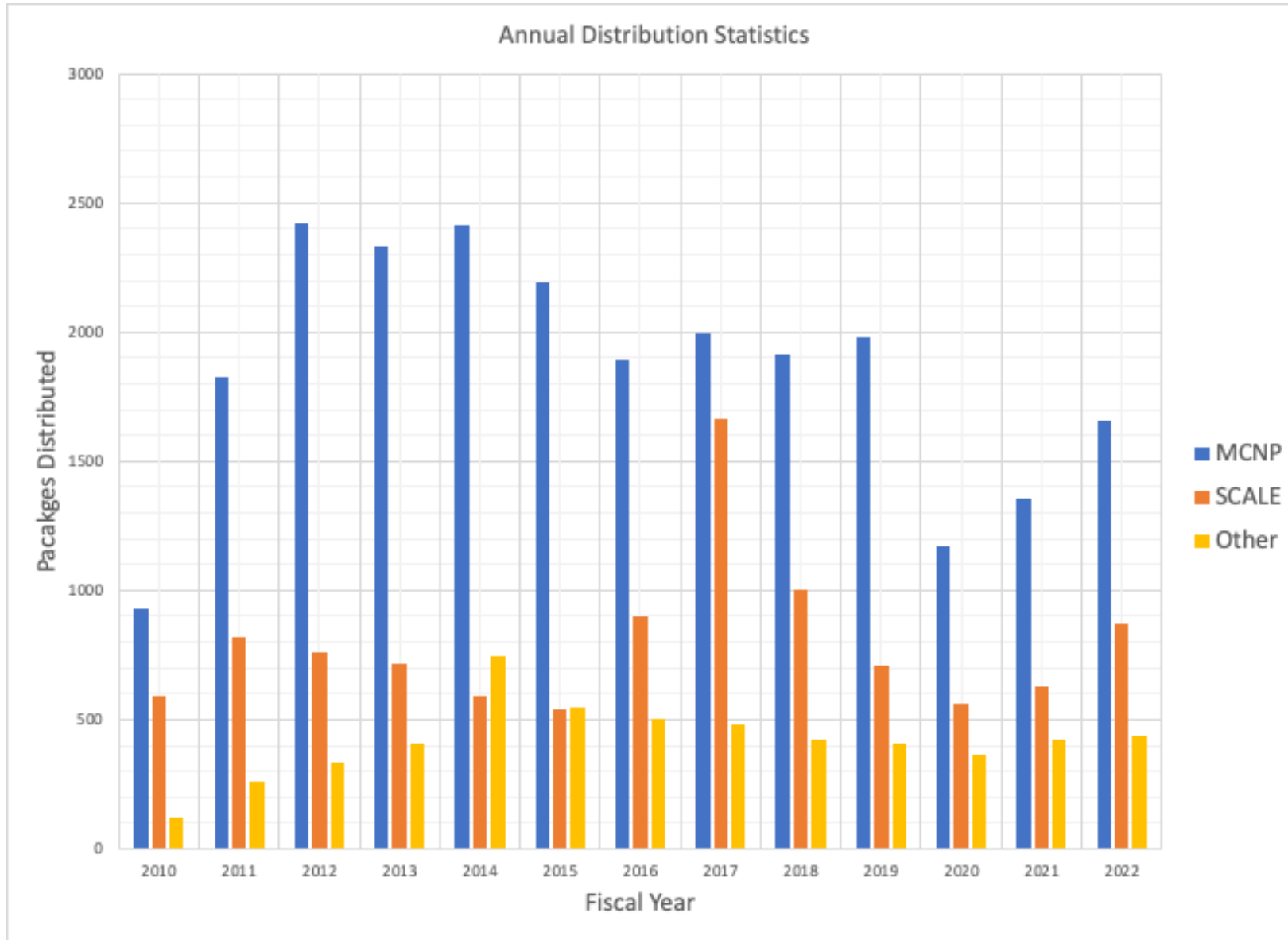


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Decrease in RSICC's Distributions in FY20 due to COVID

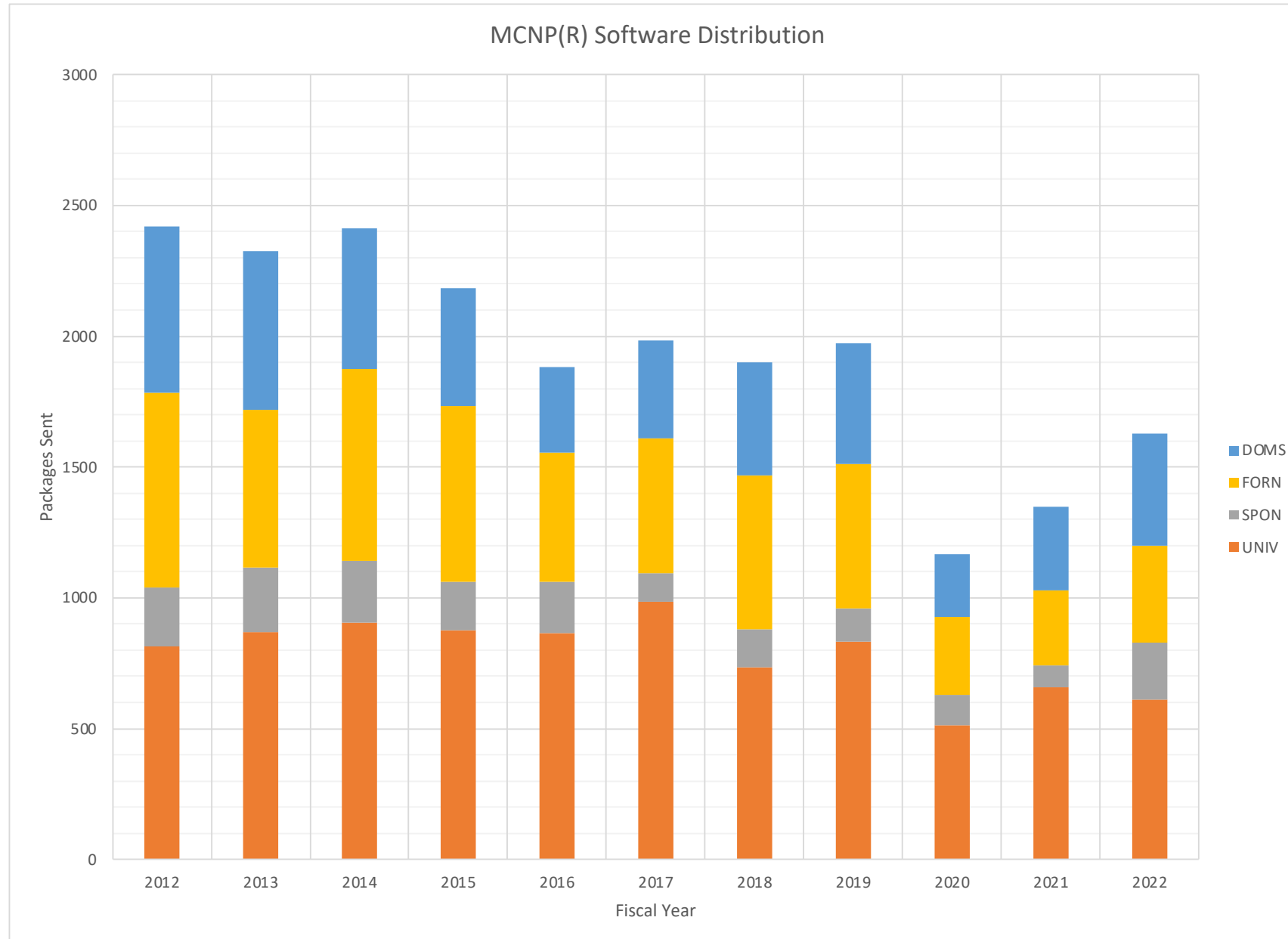


RSICC's Most Demanded Software Packages



- Increase in software demand corresponds to:
 - Growth in enrollments in nuclear engineering departments and their greater dependence on modeling and simulation tools
 - Releases of new versions of codes
- Over 24K copies of MCNP® and over 10K copies of SCALE distributed since 2010
- Growing demand for SERPENT that is only available for research purposes and ADVANTG

MCNP® Distribution by Customer Class



- Requests from universities represent the greatest number of requests annually
- Requests from domestic and foreign (non-U.S.) customers excluding universities are on par
- Requests from RSICC's sponsored customers remains steady

RSICC's Commonly Requested Software Packages

MCNP and SCALE are most in-demand packages

Fiscal Year	MCNP	SCALE	ADVANTG	SERPENT	VESTA	SWORD	PENELOPE	RELAP	SAPPHIRE	VARSKIN	RASCAL
2010	931	588	0	27	0	22	20	20	0	27	0
2011	1828	818	0	34	1	60	23	15	0	118	5
2012	2422	760	0	47	12	43	43	27	0	138	25
2013	2333	713	0	98	21	28	19	62	0	115	65
2014	2413	589	0	104	15	35	18	42	53	113	361
2015	2196	540	53	117	8	26	23	35	113	48	124
2016	1888	901	101	131	6	34	26	16	115	38	35
2017	1991	1663	64	169	3	30	23	22	97	30	32
2018	1917	1001	67	138	5	17	19	19	113	17	31
2019	1981	712	89	136	4	29	14	9	84	25	17
2020	1174	564	107	134	3	10	6	4	62	11	24
2021	1354	626	118	161	5	10	4	10	82	8	21
2022	1657	872	137	133	5	10	3	5	94	16	31

Obtaining Software from RSICC

Registering with RSICC

- Customers must provide the following information when registering with RSICC
 - Full name including first, last, and middle name (if applicable)
 - Organization name and postal address (comments can be included to have the software delivered to another location within the same country for remote workers)
 - Complete citizenship information and residency status
 - An email address associated with the individual's organization (Gmail, Hotmail, etc. not acceptable)
- Customers can register as "SELF" employed
- Contractors that support multiple organization should register under their employer and not the organization with whom they are contracting
- When an individual changes organization they must update their registration with RSICC and **dispose** of previously obtained software
 - The license agreements are specific to the organization, location, end use, and customer

Requesting Software from RSICC

- Customers must select the code that they wish to obtain
 - Older versions of software can be requested by selecting the current version and including a comment specifying the version that is needed
- Customers must provide a complete end use statement
 - Describe the type of calculations (criticality safety, dose, reactor physics, etc.)
 - Describe the application (advanced reactor design, fuel storage, medical physics, spent fuel storage, etc.)
- Customer must declare any possible use of the code for fuel cycle activities as these may not be permissible under 10 CFR 810.7 (c)
- End uses for military, maritime nuclear propulsion, and space applications are also restricted or prohibited unless directly supported by the U.S. Federal government
- Examples of acceptable end use statements
 - The MCNP® code will be used to perform criticality safety calculations associated with the storage and transport of commercial reactor fuel
 - The MCNP® code will be used to perform criticality calculations on integral benchmarks of uranium and plutonium systems for evaluation of nuclear data

Summary

- Over its 60-year history RSICC has served as a primary software and data distribution center for nuclear science and technology applications in the U.S.
- RSICC has detailed request processing procedures that are compliant with U.S. Federal regulations
 - RSICC has distributed over 150,000 software and data packages without issue
- RSICC has a standardized process for registering with and requesting software from RSICC
 - Citizenship, location, and end use determine whether software can be provided to the customer
- RSICC has a rigorous software testing and control process
 - Collaborates closely with the developers to ensure functionality on modern computing platforms
- RSICC is the primary distributor of MCNP®, SCALE, SERPENT, and ADVANTAG