

# The Radiation Safety Information Computational Center (RSICC): In Support of the Nuclear Renaissance and Human Resource Development



The Coming Nuclear Renaissance for the Next Generation Safeguards Expert Maximizing Benefits While Minimizing Proliferation Risks December 15-18, 2008

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<http://rsicc.ornl.gov>  
Nuclear Science and Technology Division

# RSICC Home Page

http://rsicc.ornl.gov

The screenshot shows a Windows Internet Explorer browser window displaying the RSICC Home Page. The address bar shows the URL <http://rsicc.ornl.gov/>. The page header includes the text "Oak Ridge National Laboratory | Nuclear Science & Technology Division | Disclaimer" and the main title "Radiation Safety Information Computational Center RSICC" with the tagline "Delivering the Best Computational Tools for Nuclear Research". Below the title is a "Package Index" with letters A through Z. A left sidebar contains a menu with items: Home, About RSICC, Codes & Data, Registration & Ordering, eNotebooks, Workshops, News, Benchmarks, BioMedical Applications, ANS Links, Related Links, RSICC Search, and Contact Us. The main content area features a large image of a hand holding a computer mouse over a keyboard, a smaller image of the Oak Ridge National Laboratory building, and a section titled "RSICC ANNOUNCEMENTS". A paragraph of text describes the center: "The Radiation Safety Information Computational Center (RSICC) is a Department of Energy Specialized Information Analysis Center (SIAC) authorized to collect, analyze, maintain, and distribute computer software and data sets in the areas of radiation transport and safety." The Windows taskbar at the bottom shows the Start button, several open applications, and the system tray with the time 7:56 AM.

# PROLOGUE

RSICC came into existence in 1962 largely as a result of the report made by **Alvin Weinberg** and others to the Executive Office of the President of the United States on the “information explosion” and the role of the technical community and government in its preservation and use. This report became known as the Weinberg Report. Its theme was “Information is an integral part of science; without proper handling of information, science cannot function.” The report recommended the establishment of specialized information centers - “to digest and evaluate - to make condensations and reviews -thus saving the time of the individual research scientist and engineer.”

# RSICC in 1960s



The Radiation Shielding Information Center (RSIC) staff gathers for a meeting in the late 1960s (from left): Juanita Brown Wright, Henrietta Hendrickson, Betty Maskewitz, Patti Cunningham, David Trubey, Vivian Jacobs, Hemma Francis Comolander, Mildred Landay, Wallace Webster, Jane Gurney, and **Fritz Schmidt of the Stuttgart Technical University, Germany**

# Radiation Safety Information Computational Center (RSICC) Historical Background

- **Established in 1962 by USAEC to support its reactor research programs in a research division at Oak Ridge National Laboratory**
- **Embedded in the Nuclear Science and Technology Division (NSTD) at ORNL**
- **Funded by Department of Energy, Nuclear Regulatory Commission and Department of Homeland Security**

**preserve and disseminate nuclear software and data**

# Goals

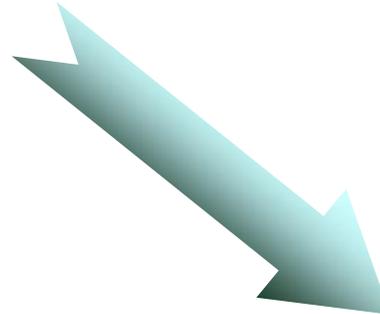
- **Goal A: To acquire and distribute software to provide researchers a centralized source for quality controlled radiation modeling and simulation tools.**
- **Goal B: To ensure the preservation of nuclear computational tools in order to support the next generation of scientists.**
- **Goal C: To support the training of the next generation of scientists by providing internship opportunities to nuclear science students**

# RSICC History



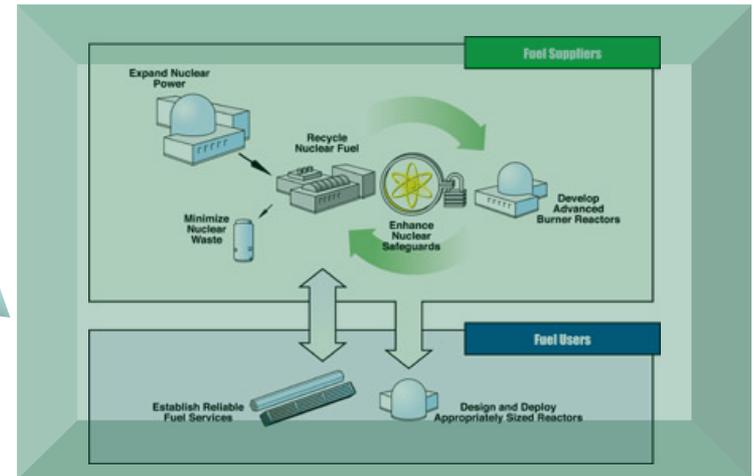
<http://seniordesign.engr.uidaho.edu/>

1960  
EBR-II



2006

Global  
Nuclear  
Energy  
Partnership  
(GNEP)



<http://www.gnep.gov>

# RSICC History



<http://seniordesign.engr.uidaho.edu/>

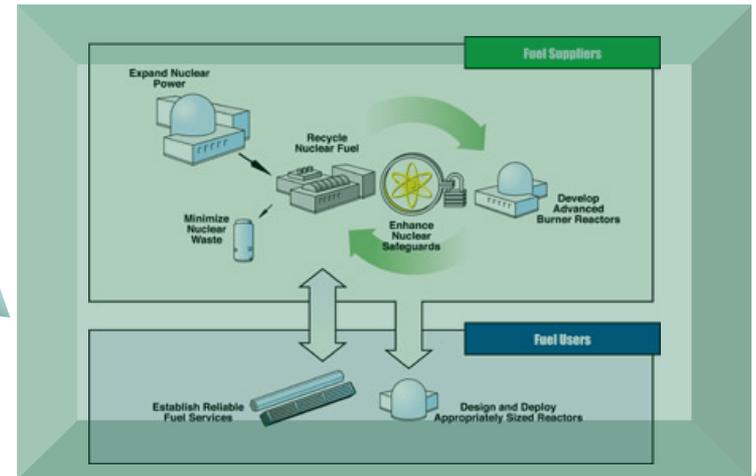
1960

EBR-II

Closed  
fuel cycle

Current

Closed  
fuel cycle



<http://www.gnep.gov>

# Moments In RSICC History

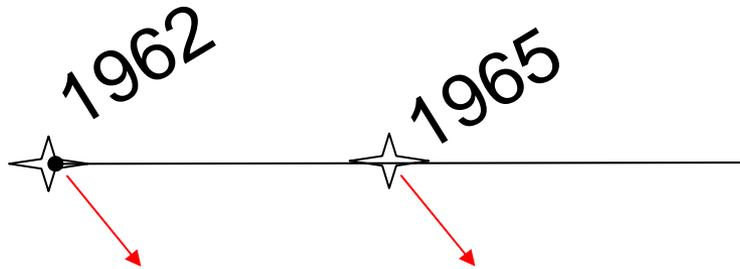
1962



**RSICC Founded**

- First Kernel integration and Monte Carlo codes
- Programmed for IBM 704

# Moments In RSICC History

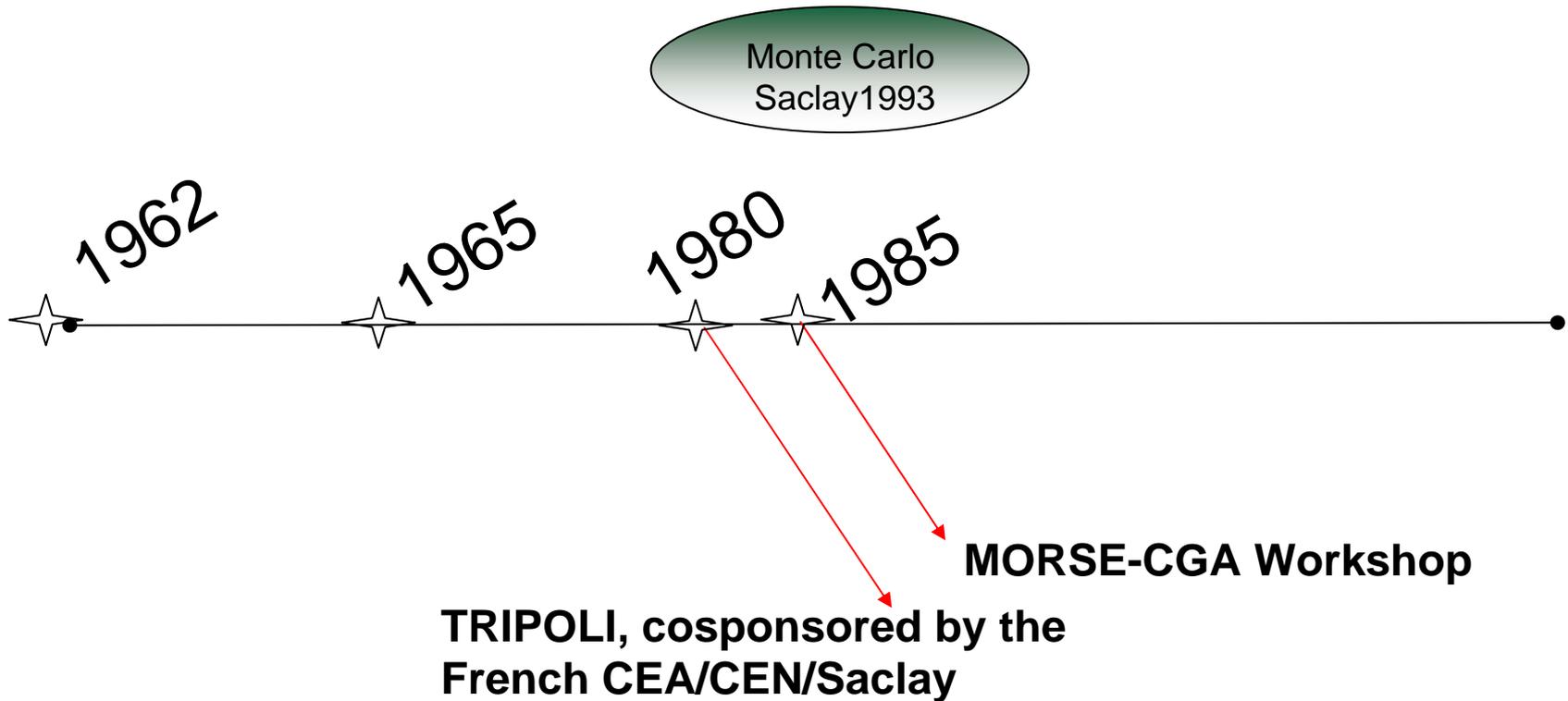


**O5R Monte Carlo Code Workshop**  
**80 participants from 45 institutions**

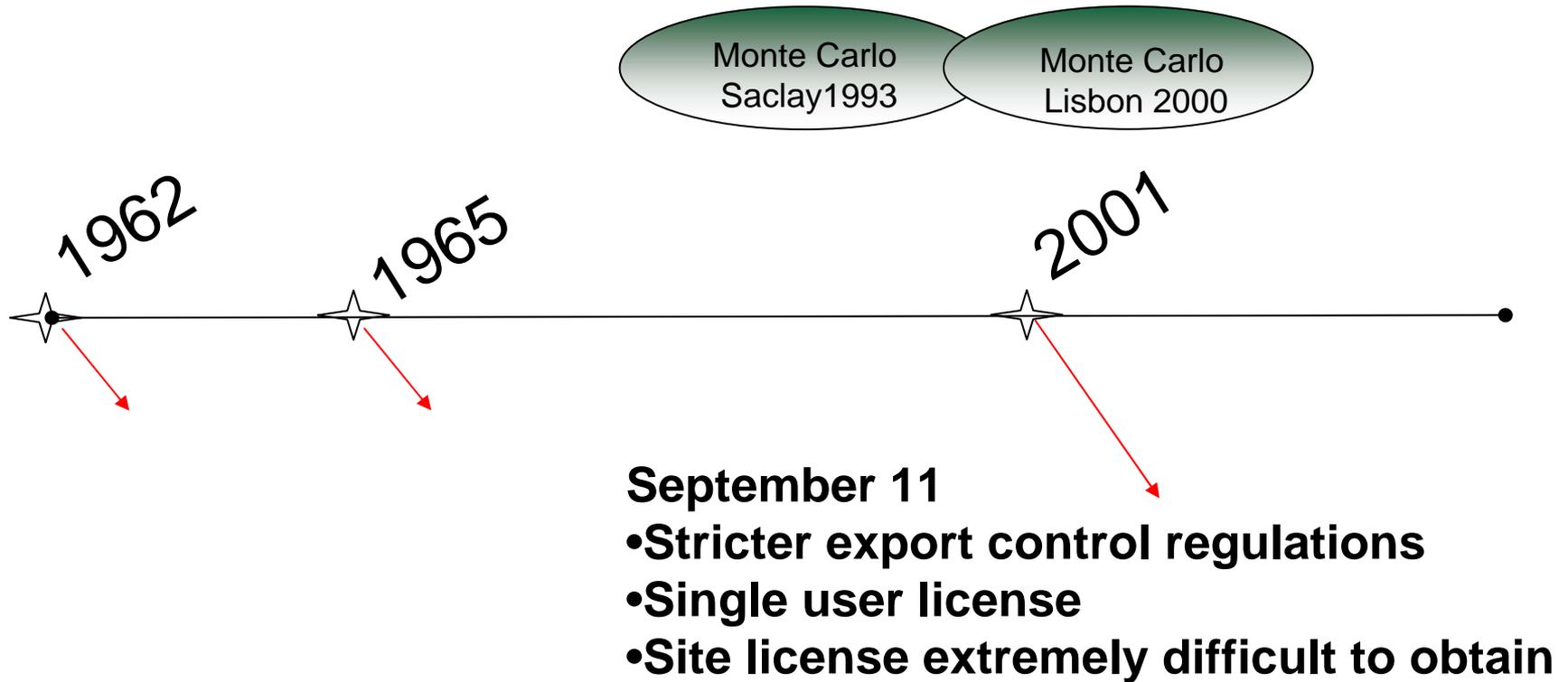
**Moore's Law**

Electronics, Volume 38, Number 8, April 19, 1965

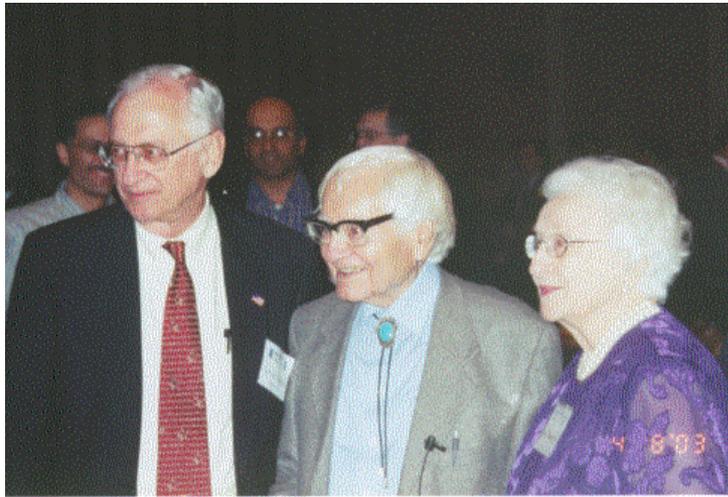
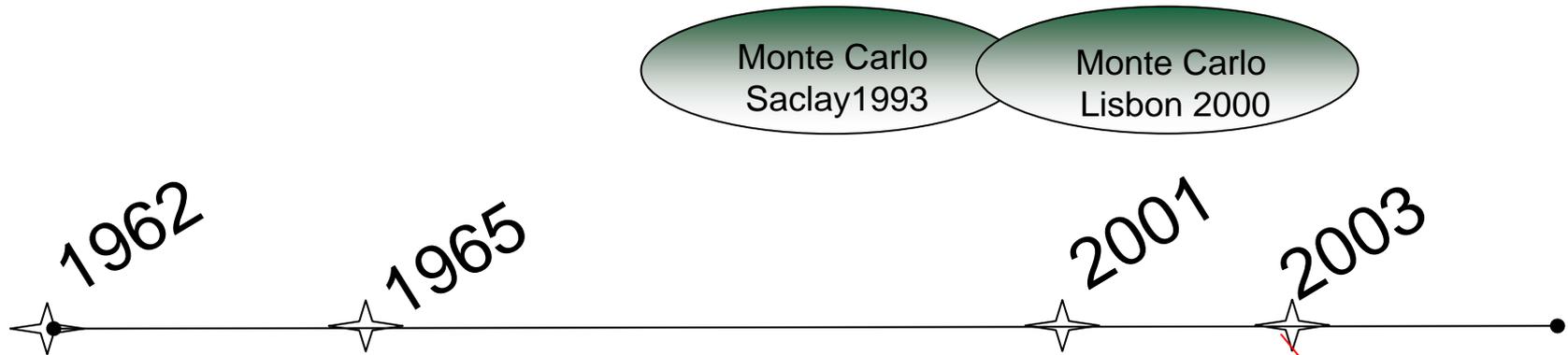
# Moments In RSICC History



# Moments In RSICC History



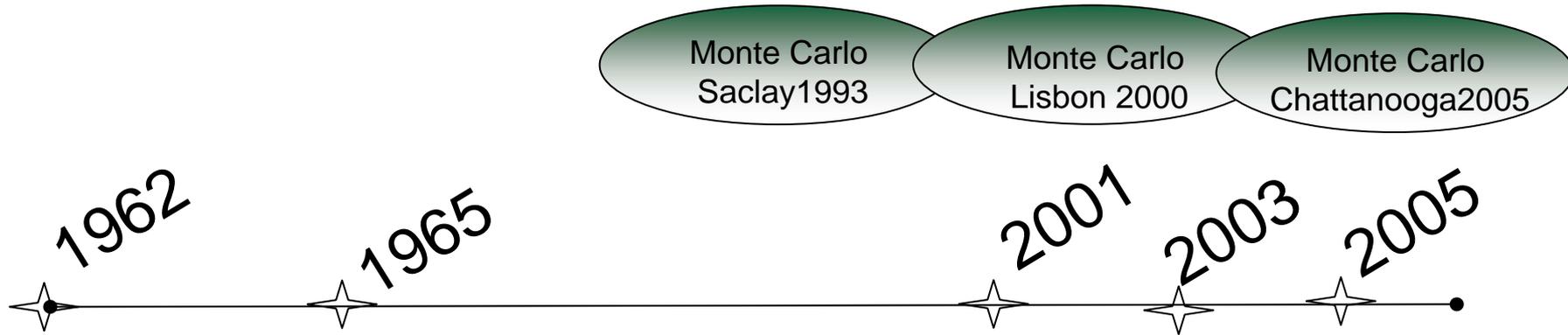
# Moments In RSICC History



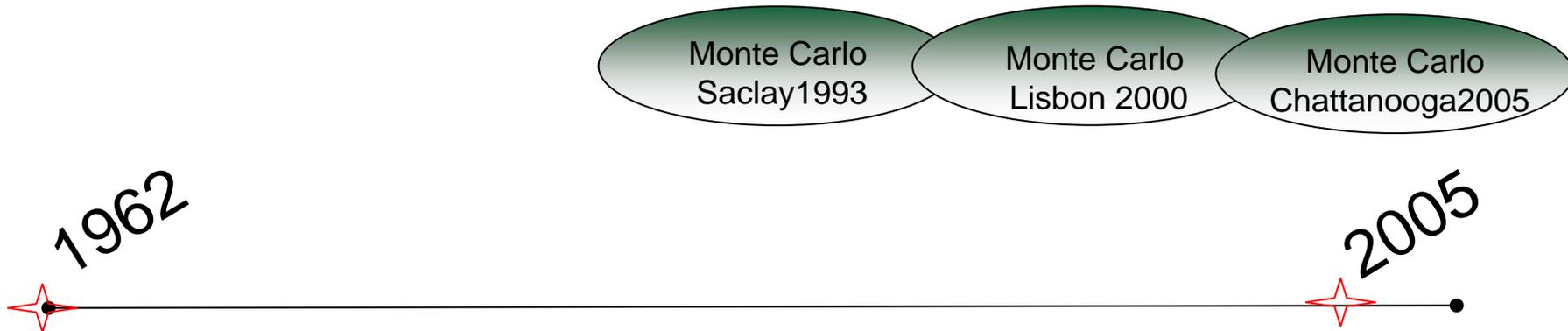
**RSICC celebrated 40<sup>th</sup> anniversary during M&C 2003 in Gatlinburg, Tennessee.**

**Alvin Weinberg delivers his speech on “The Immortal Reactor,” an exploration of the concept of building longevity into the design and construction of the next generation of nuclear power plants.**

# Moments In RSICC History



# Moments In RSICC History



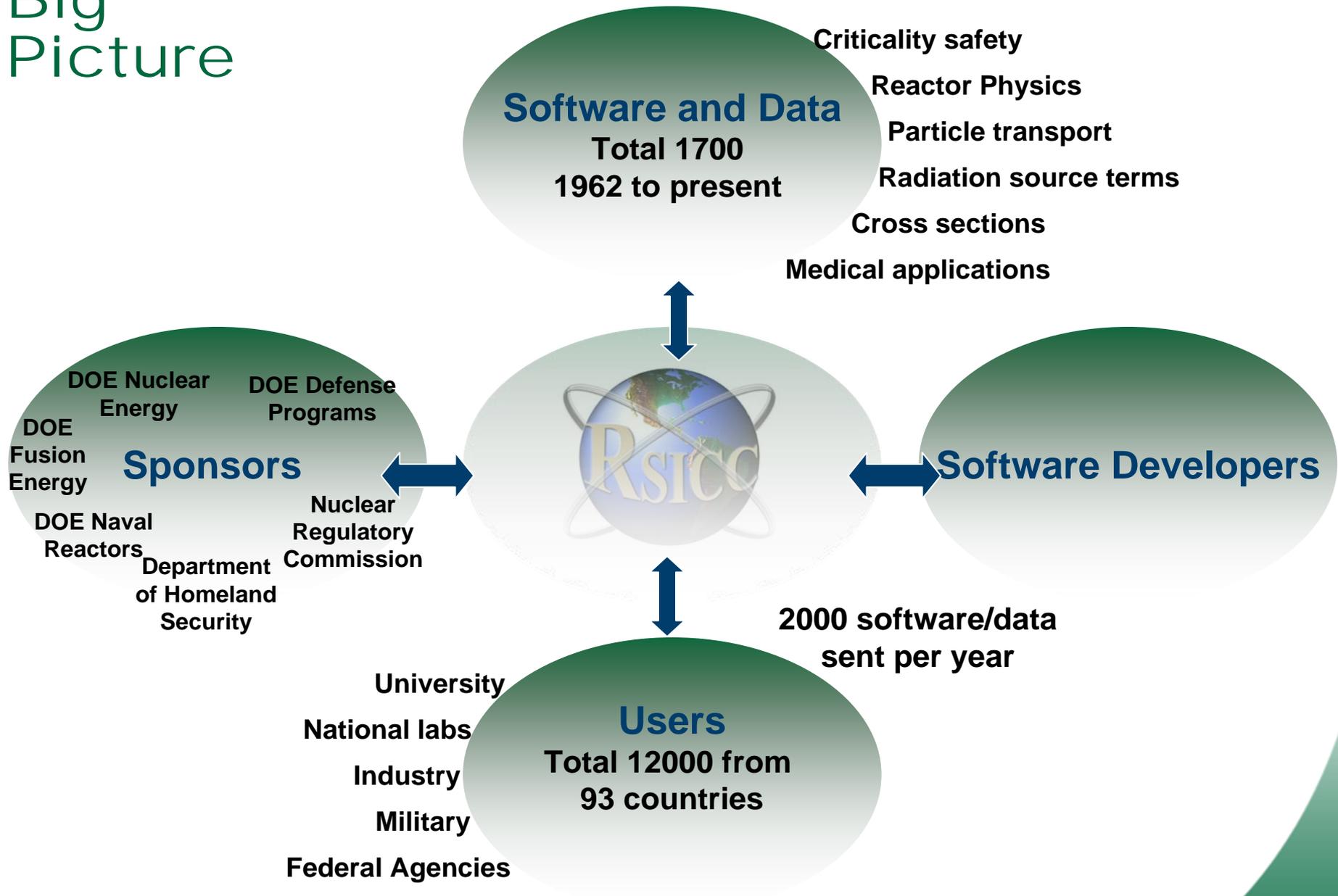
**1700 software/data**  
**Over 215 Monte Carlo software**

EGS4  
HETC  
KENO  
MCNP  
MCNPX  
MORSE  
PENELOPE  
TART  
TRIPOLI

# Representative RSICC Software for Reactor Physics and Dosimetry

- **SCALE**
- **MCNP**
- **TRIPOLI**
- **TART**
- **VIM**
- **EASY/FISPACT**
- **WIMSD-5B**
- **DOORS**
- **PARTISN**
- **ORIGEN**

# Big Picture



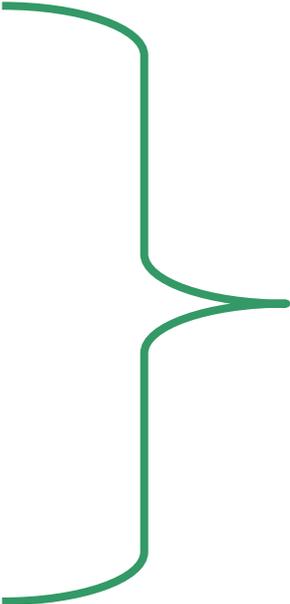
# Software

## 26 Main RSICC Software Categories

ACCELERATOR APPLICATIONS	HUMAN FACTORS ENGINEERING
AUXILIARY MATHEMATICAL METHODS AND UNCERTAINTY ANALYSIS	ISOTOPE GENERATION AND DECAY
BENCHMARKS	MATERIALS AND RADIATION EFFECTS
BIOLOGY AND MEDICINE	NUCLEAR DATA GENERATION FOR TRANSPORT CODE INPUT
CROSS-SECTION DATA, FACTORS, AND COEFFICIENTS	NUCLEAR CRITICALITY SAFETY
DECOMMISSIONING, DECONTAMINATION, AND REUTILIZATION	NUCLEAR DATA POST-PROCESSOR, GRAPHIC DISPLAY, CURVE FITTING
DEFENSE NUCLEAR ANALYSIS	NUCLEAR PARTICLE TRANSPORT IN MATERIALS
DOSE COMPUTATION AND FACTORS	NUCLEAR SYSTEM SAFETY ANALYSIS
EARTH AND ATMOSPHERIC NUCLEAR PHYSICS	NUCLEAR SYSTEMS ANALYSIS
ENVIRONMENTAL TRANSPORT OF RADIONUCLIDES	RADIATION PROTECTION AND SHIELDING
EXPERIMENTAL DETECTOR ANALYSIS AND SPECTRAL ANALYSIS	REACTOR PHYSICS
FUEL CYCLE AND WASTE MANAGEMENT	SPACE NUCLEAR PHYSICS
FUSION ENERGY	THERMODYNAMICS AND FLUID DYNAMICS

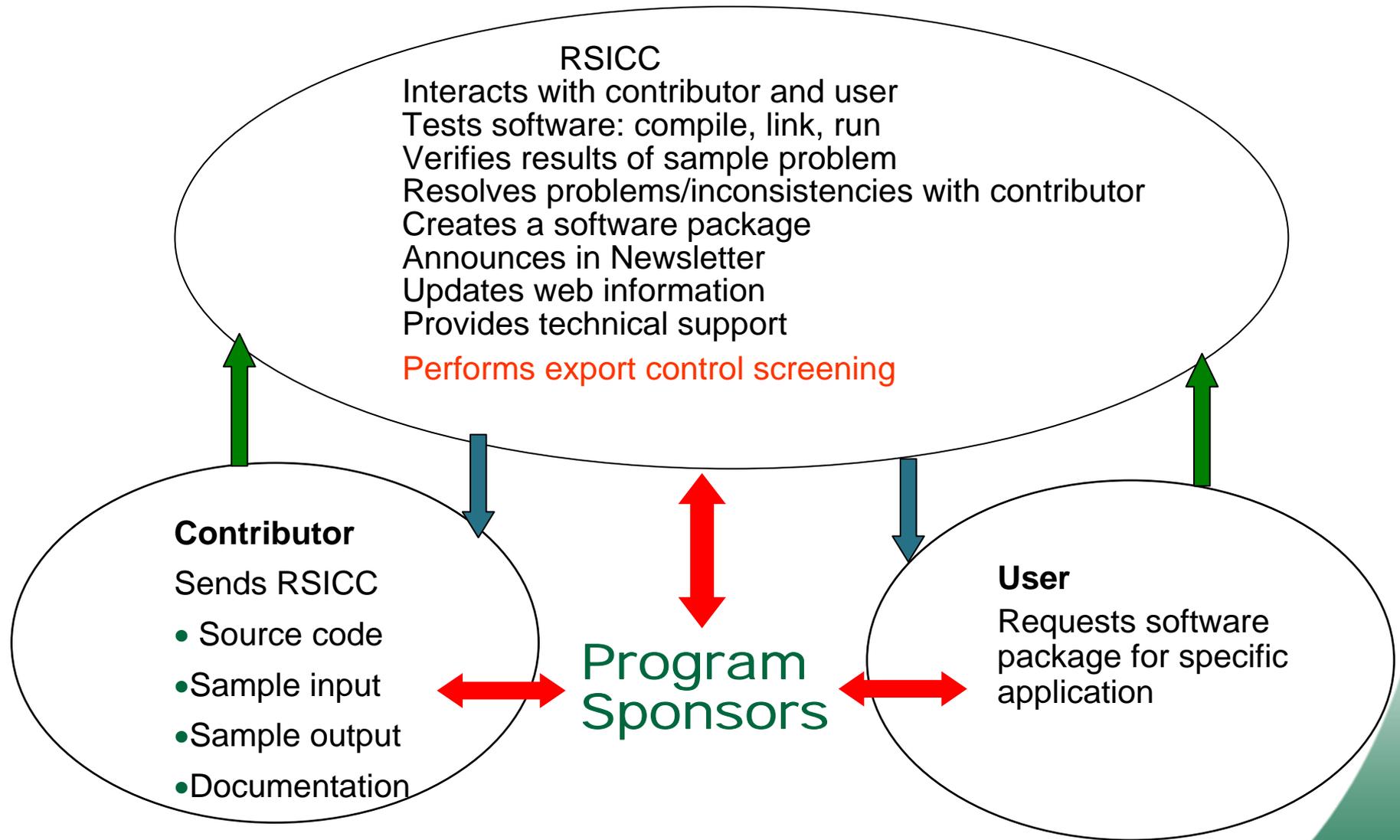
# RSICC Software Package

- **Source Code**
- **Sample problem input**
- **Sample problem output**
- **Documentation**
- **Executable program**
- **Cross section data**

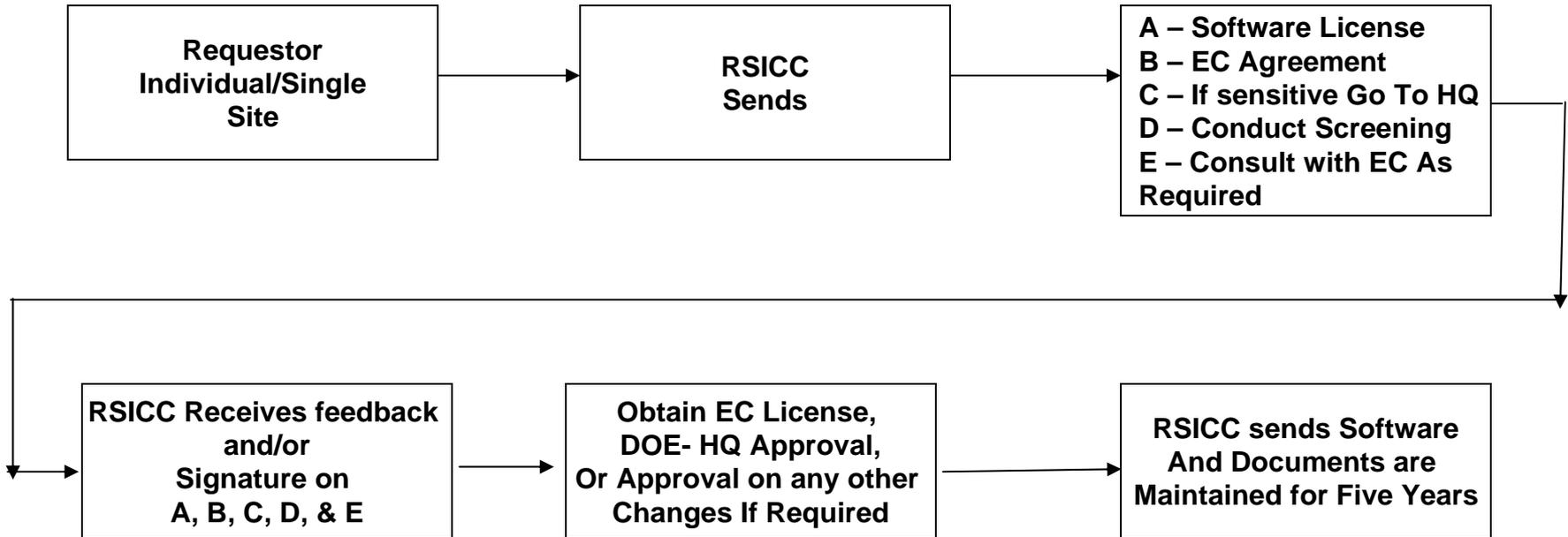


Software package

# "LIVE" Collection



# Export Control Process



# Quality Services

- ✓ **Quality testing and control of newer versions of software**
- ✓ **Entire collections of software and associated data**
- ✓ **Web-based electronic notebooks for exchange of software needs and ideas**
- ✓ **Technical support**
- ✓ **Statistical information on users and codes**
- ✓ **Monthly Newsletter**
- ✓ **Quarterly Reports**

# SCALE5 Electronic Notebook

**SCALE5 Notebook**

[Add](#)  
[Search](#) [Print](#)

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DOE 2000 Electronic Notebook

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# SCALE5 Electronic Notebook Sample Entry

Notebook page 223 - Windows Internet Explorer

http://rsicc.ornl.gov/rsic-cgi-bin/enote.pl?nb=c725&action=view&page=last

File Edit View Favorites Tools Help

Google G Go Bookmarks 16 blocked Check AutoLink AutoFill Send to Settings

Notebook page 223

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Add Edit Delete Annotate Notarize

First Previous Next Last Contents Print Search

Date and Author(s) Notarized Tue Sep 30 02:33:51 2008 (GMT) by N/A

DOE 2000 Electronic Notebook

**Discrepancy in ENDF/B-V Be cross sections in SCALE5.1**

I am running a model of HEU-MET-FAST-030 (attached). When I run it with v6-238, I get  $k=1.0064$ , about right. When I switch to the 238gr library, I get  $k=1.0575$ , a rather significant difference. If I switch to SCALE5.0, using 238gr I get  $k=1.0041$ , again about right. The discrepancy in SCALE5.1 occurs both on Windoze and LINUX. Can you figure this one out? Thanks.

Gary

\*\*\*\*\*

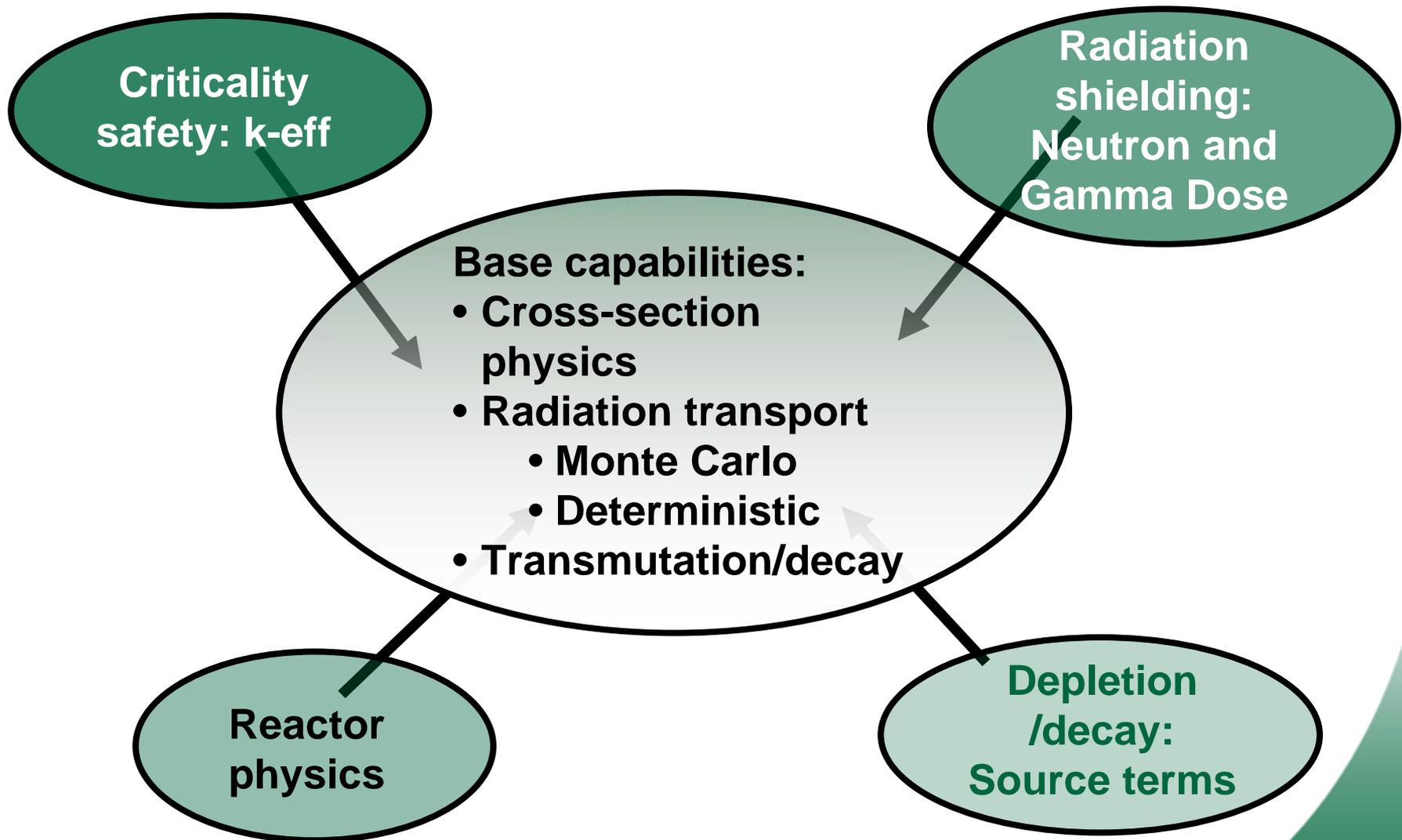
I switched the beryllium from Be to Bebound and the keff's are

238gr	1.0021
v6-238	1.0054

That seems better

Local intranet 100%

# SCALE Analysis Capabilities



# Computational Tools and Nuclear Applications

DOORS

MCNP/MCNPX

PHITS

FLUKA

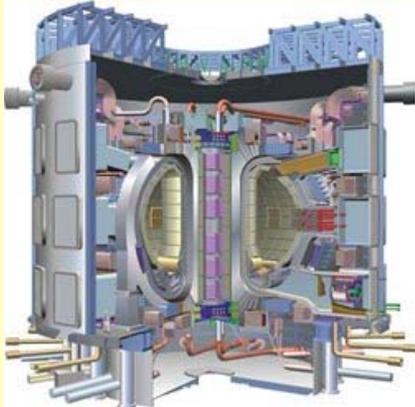
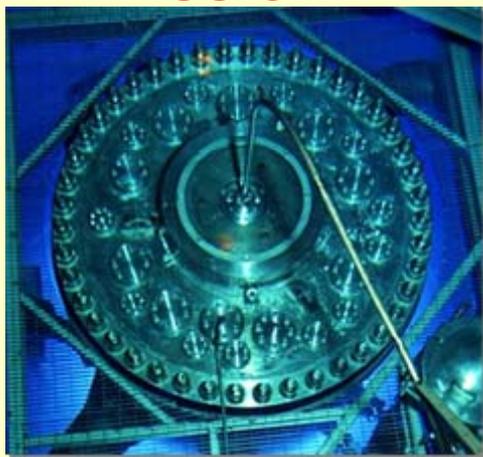
FISSION

FUSION

ACCELERATORS

EGS5

PENTRAN



ATTLA

PARTISN

PENELOPE

TRIPOLI

GEANT4

# Computational Tools and Science Facilities

**EGS5**

**DOORS**

**MCNP/MCNPX**

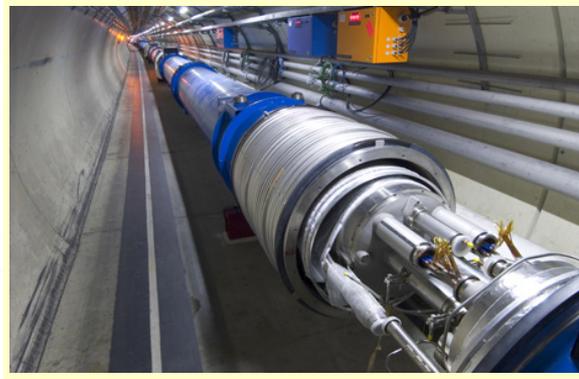
**PHITS**

**FLUKA**

**Spallation Neutron Source**

**Large Hadron Collider**

**Japan's J-PARC**



**ATTILA**

**PENTRAN**

**PARTISN**

**PENELOPE**

**TRIPOLI**

**GEANT4**

# Computational Tools and Medical Physics

DOORS

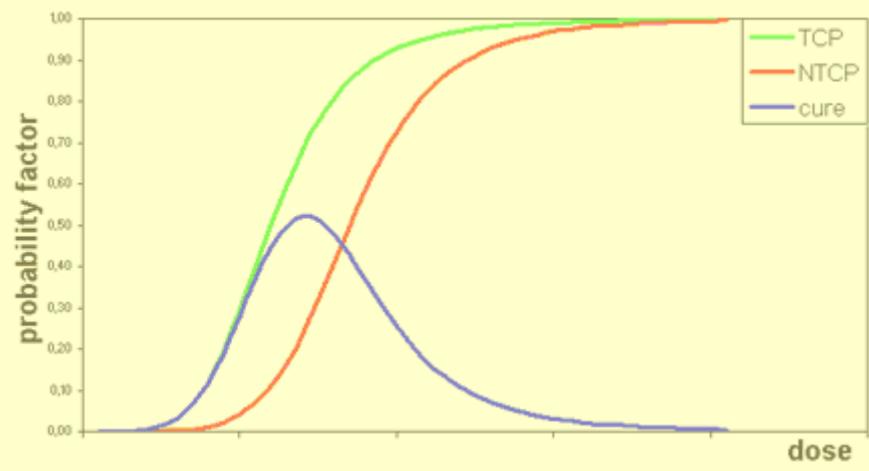
MCNP/MCNPX

PHITS

EGSnrc

EGS5

PENTRAN



ATTLA

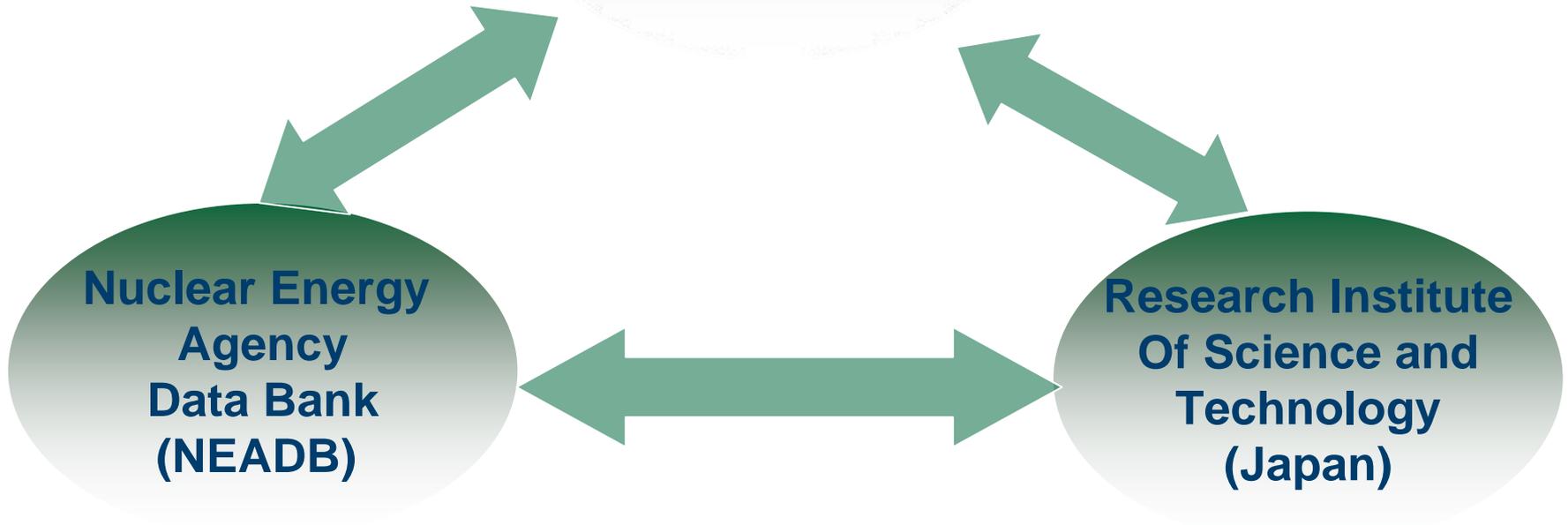
PARTISN

PENELOPE

TRIPOLI

GEANT4

# International Partners

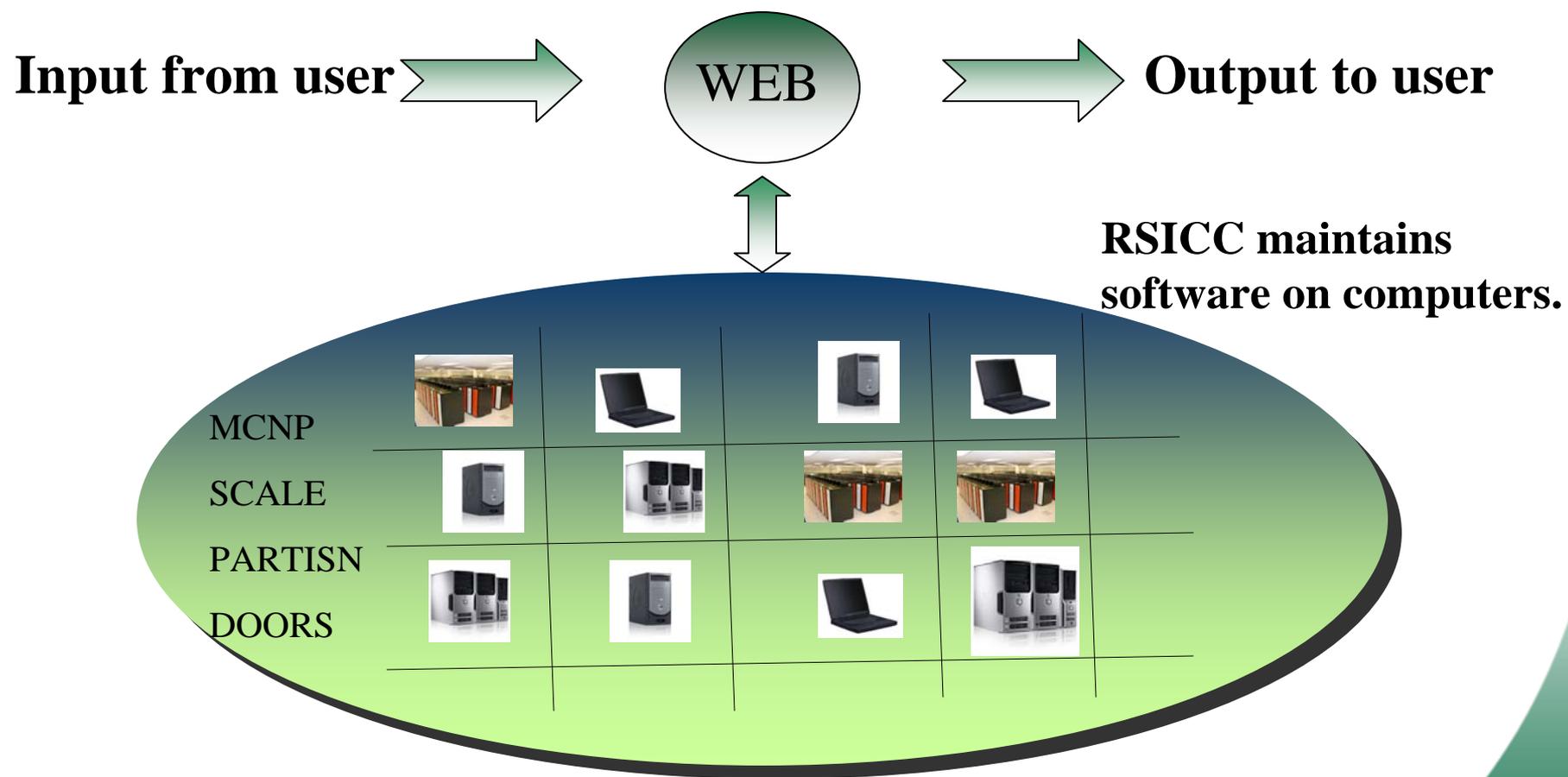


# RSICC and Universities

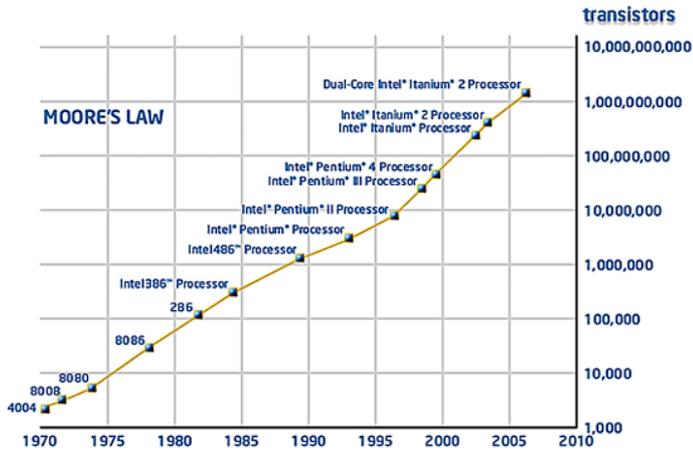
- **Manages the Nuclear Engineering (NE) Students Laboratory Synthesis (NESLS) summer internship program at ORNL to train future nuclear engineers**
- **Over 1000 customers from NE universities.**

# RSICC Vision for Future

## Computational Grid for Nuclear Technology Software

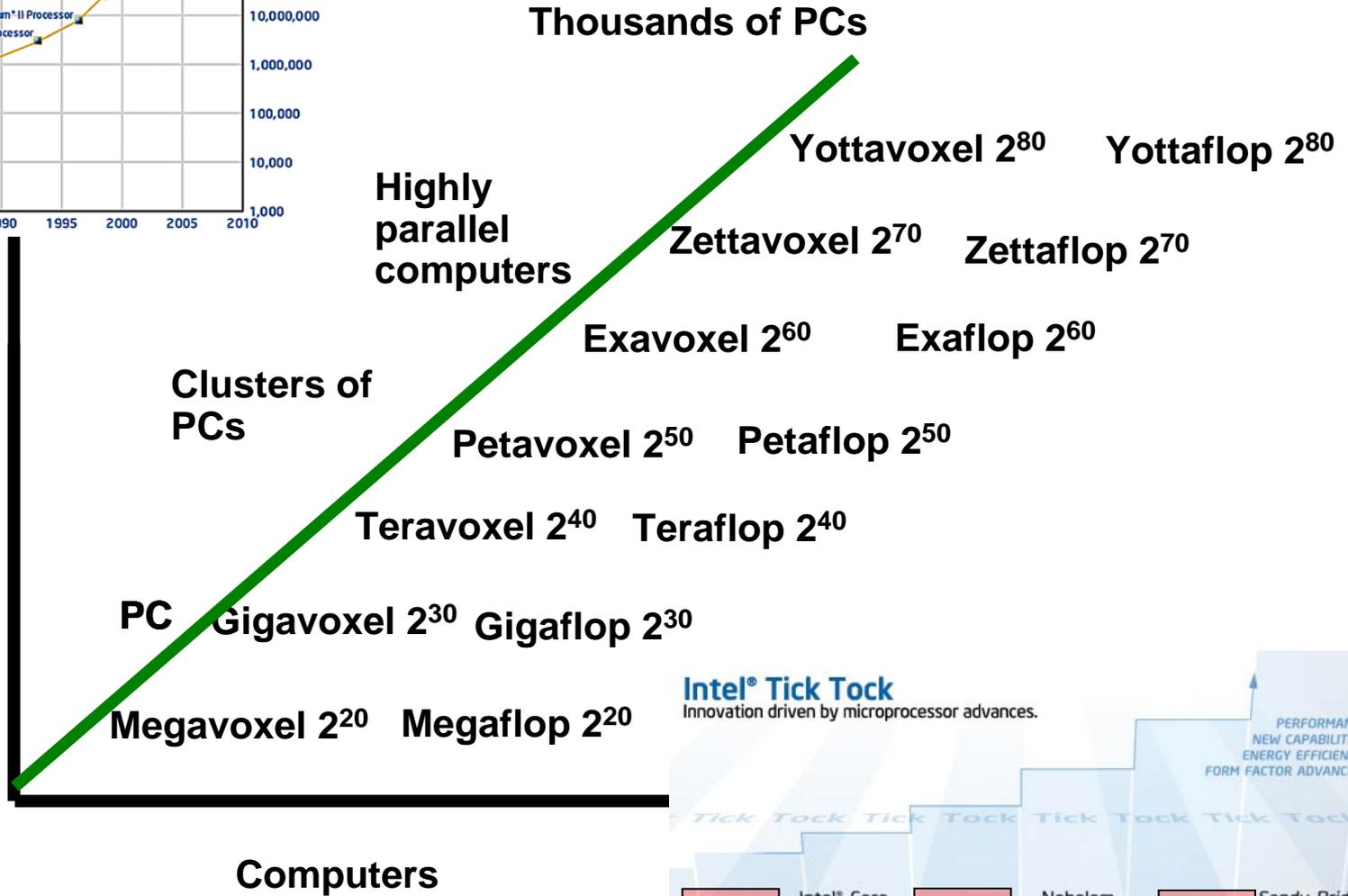


# The Future

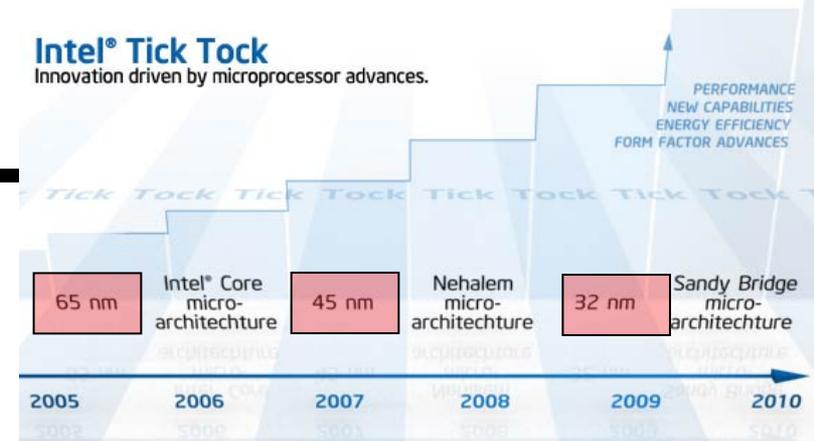


Source: <http://intel.com>

**Complexity of Problem**



**Intel® Tick Tock**  
Innovation driven by microprocessor advances.



Source: <http://intel.com>

# Epilogue



Betty Maskewitz  
"RSICC is and will be."