



NCSP IE and T&E Activities at Sandia

Nuclear Criticality Safety Program Technical Program Review

Livermore, CA

March 19, 2015

Presented by

Gary A. Harms

Sandia National Laboratories

SAND2015-1973 PE



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Sandia Integral Experiment Requests

IER	Title	Sponsor	CED
206	Re-establish the 4.3% Enriched Critical Experiment Capability at Sandia	SNL	3A
208	7uPCX 0.800 cm Pitch, Variable Depth Pure Water Moderator Experiments	SNL	3B
209	7uPCX 0.855 cm Pitch, Variable Depth Pure Water Moderator	SNL	2
226	General-Purpose Horizontal Split-Table Critical Assembly	NCSP	2
230	Characterize the Thermal Capabilities of the 7uPCX	SNL	2
285	Titanium cross sections in a thermal application	SRNL	3B
304	Temperature dependent critical benchmarks	ORNL	0
305	Critical Experiments with UO ₂ Rods and Molybdenum foils	IRSN	1
306	Critical Experiments with UO ₂ Rods and Rhodium Foils	IRSN	1

I will focus on two IERs

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IER208

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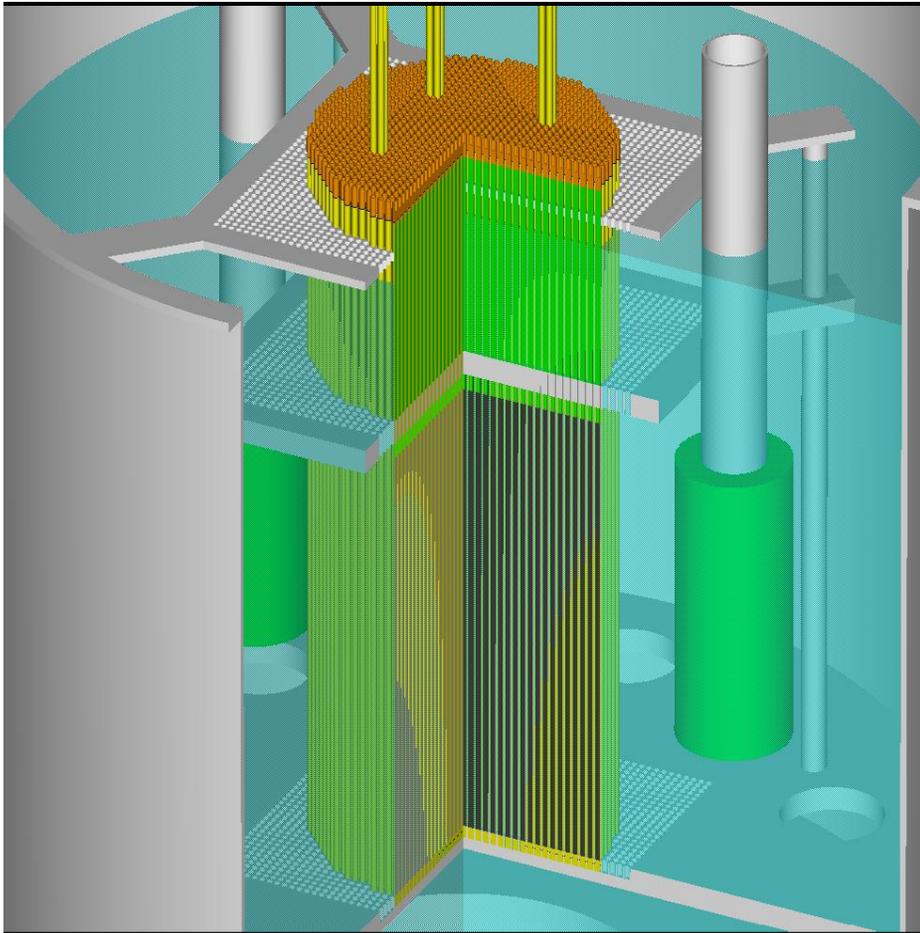


IER-208

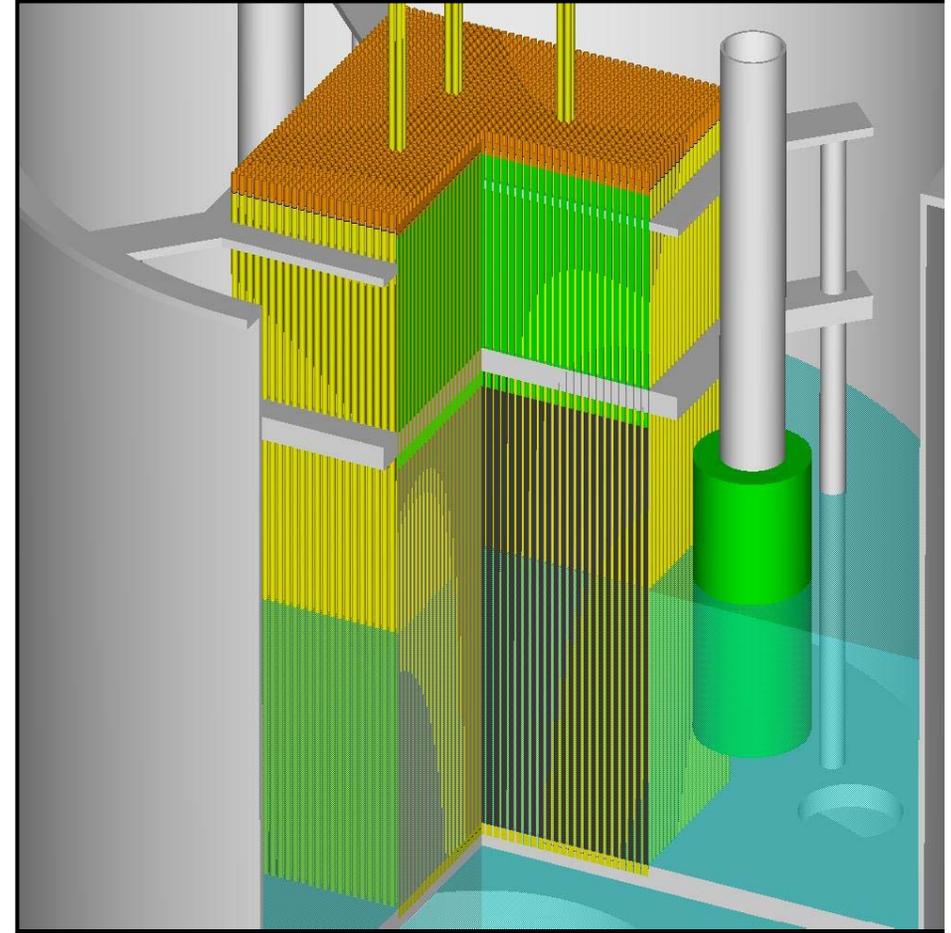
- **This is our first set of benchmark-quality experiments using the height of the water moderator/reflector in the assembly tank as the approach variable**
- **Two new hardware systems were installed on the critical assembly**
 - **The Remotely Adjustable Standpipe (RASP) limits the excess reactivity available during an experiment.**
 - **Four ultrasonic level sensors to measure the height of the water in the tank**



We are now measuring “partially reflected” configurations

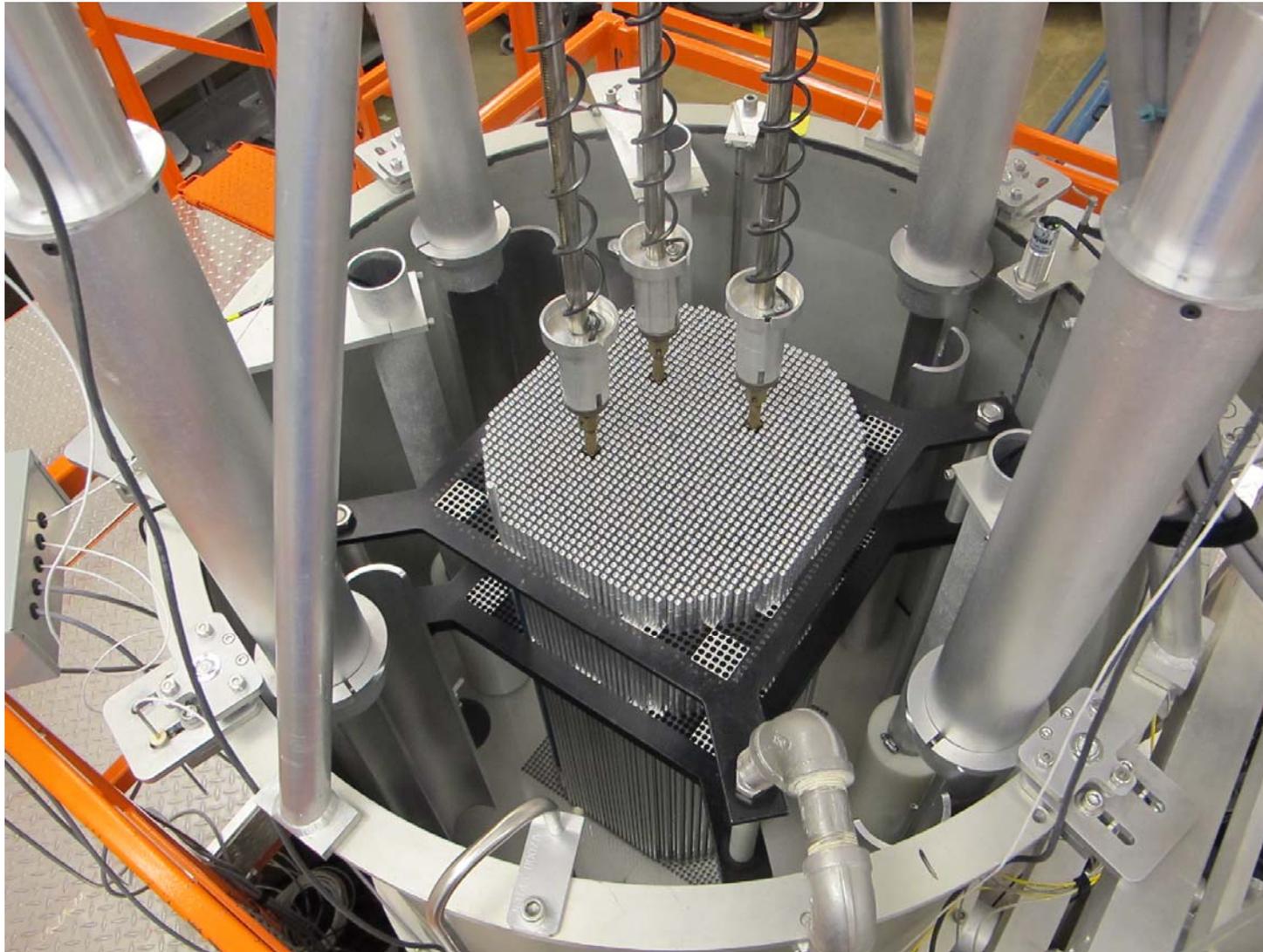


“Fully-Reflected”

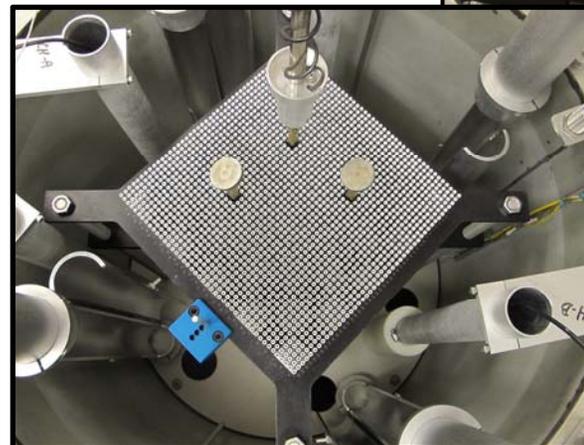
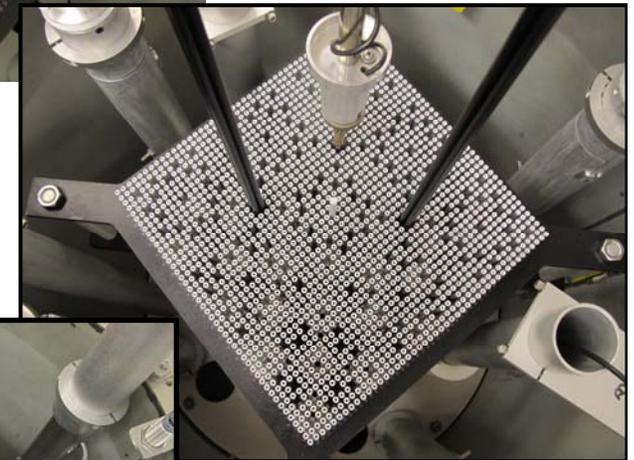
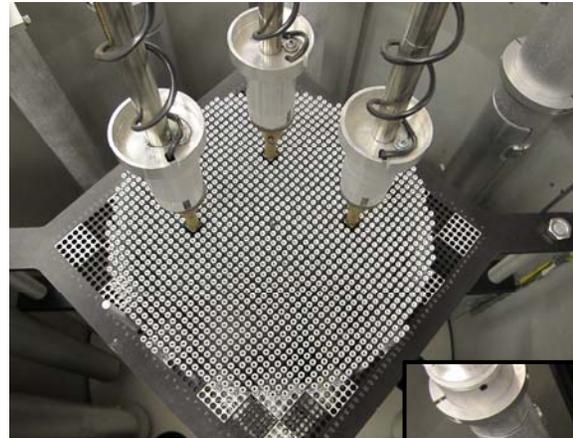
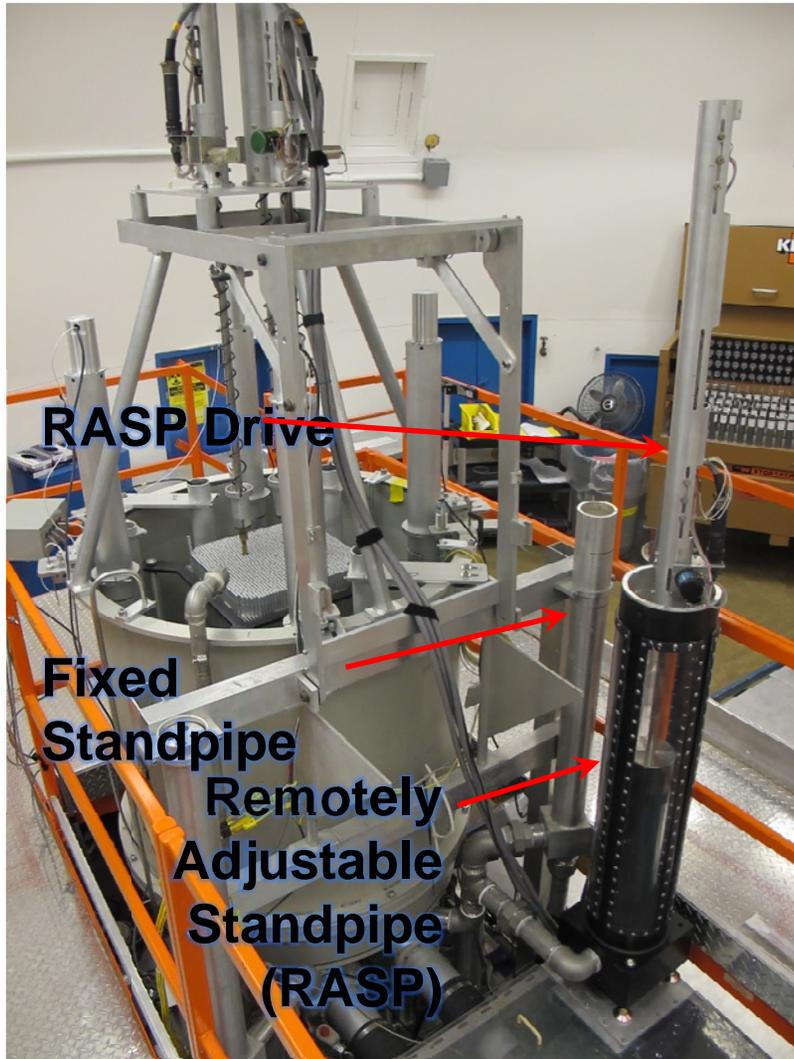


“Partially-Reflected”

IER208



IER208



IER226

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Our charge

Estimate the cost of:

A large, 6' x 6' or greater, horizontal split table at SNL working under the current security cat environment.

J. N. McKamy

July 12, 2012

The NCSP Mission and Vision had a general-purpose horizontal split table critical assembly as a five-year goal



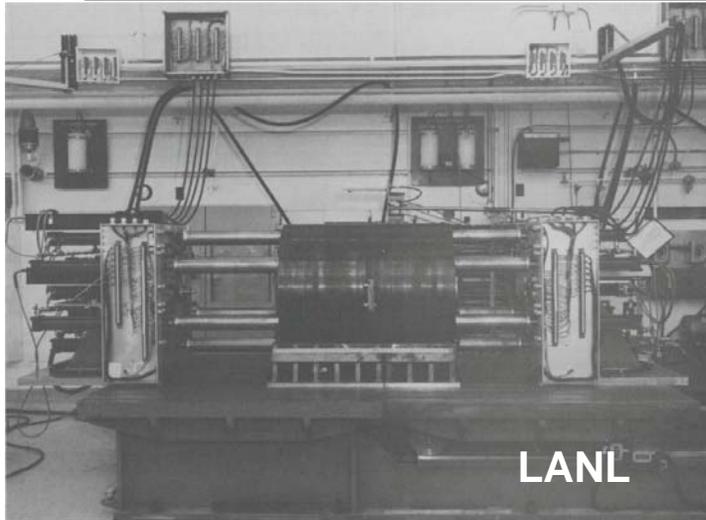
Low-Enriched General-Purpose Split-Table Critical Assembly – IER-226

- **$C_E dT$:**
 - Allison Miller (SNL)
 - Mike Dunn (ORNL)
 - Thomas Miller (ORNL)
 - Dave Heinrichs (LLNL)
 - Gary Harms (SNL)
- **CED-1 Conceptual Design is complete**
- **CED-2 Final Design has been initiated**
- **This IER was placed on hold**

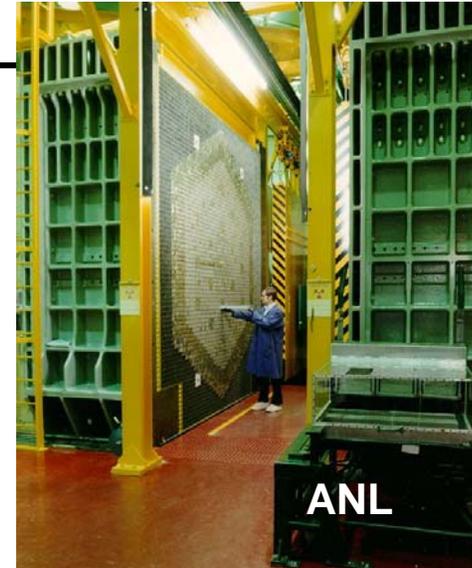
- **Note that this IER is for the design of the Critical Assembly, not for a specific experiment**



Horizontal Split-Table Critical Assemblies in the US

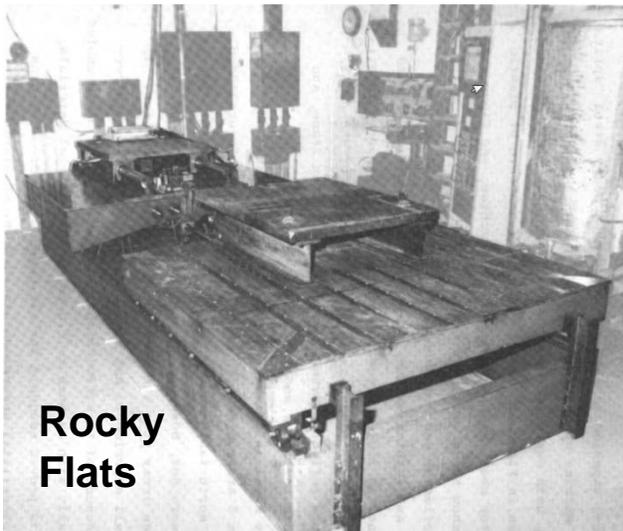


LANL



ANL

- We did a literature survey of past split tables in the US



Rocky Flats

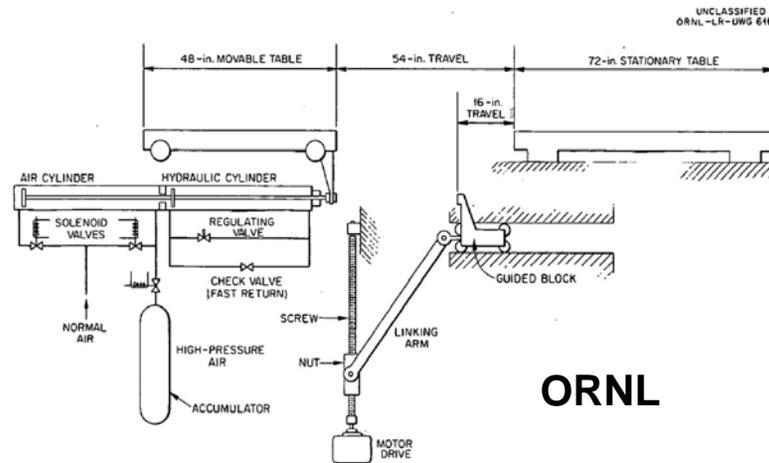


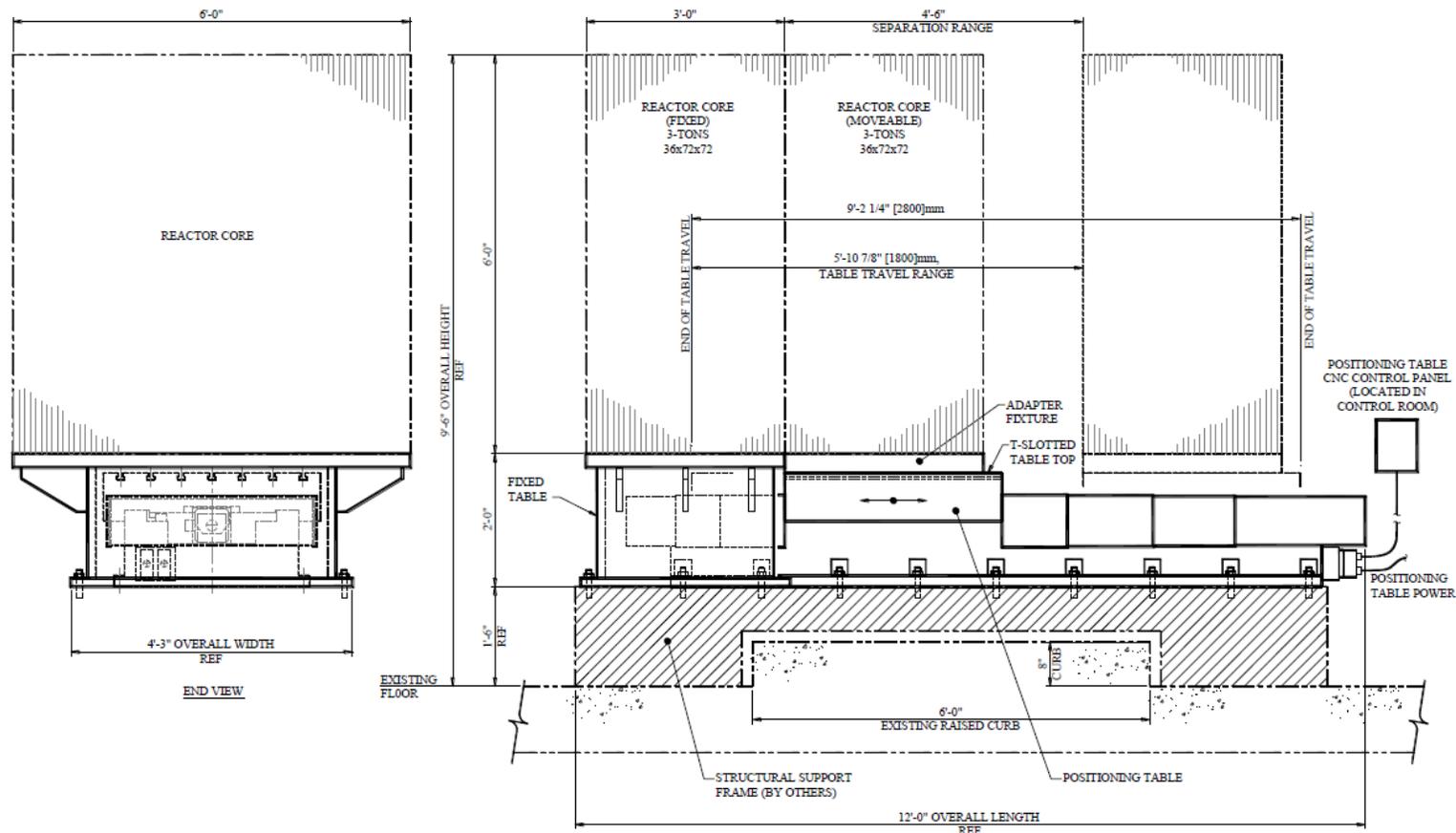
Fig. 3.6.3. Schematic of Drive Arrangement for Split-Table Machine.



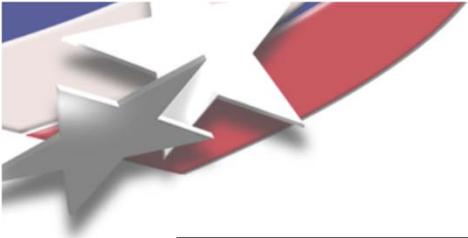
Design Options

- **All past systems we surveyed were constructed from purpose-built components**
- **OPTION 1 – do the same thing here**
 - All components designed and built from scratch
- **OPTION 2 – use commercial “off-the-shelf” (COTS) components where possible**
 - In particular, the movable table shares many characteristics with existing large boring/milling machines
 - Can one of these machines be the basis for the critical assembly?

Option 2 Using a COTS Movable Table Appears to be the Most Cost-Effective Approach



The assembly would consist of a modified commercial boring/milling machine and a purpose-built fixed table



IER226

- **A meeting was held with NCSP management, the CSSG, and other stakeholders to determine experiment needs**
- **The progress on the design of the Horizontal Split Table was presented**
- **The consensus of the group was that the current need for the machine was low**
- **The IER was placed on hold**
 - **Progress will be documented**
 - **Further work on IER-226 will be discontinued**



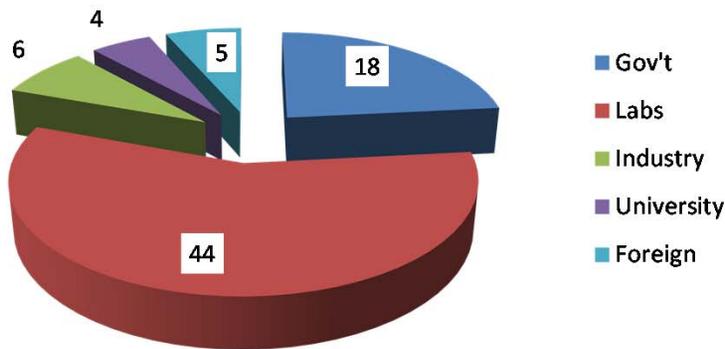
Hands-On Criticality Safety Training at Sandia

- Two hands-on critical experiment classes are currently offered.
- The first is part of a two-week class for Nuclear Criticality Safety Professionals, 1 week at LANL and one week at Sandia or at NCERC.
- The other is a one-week class at Sandia for Nuclear Material Managers.
- Information about the classes and how to register is at <http://ncsp.llnl.gov/classMain.html>

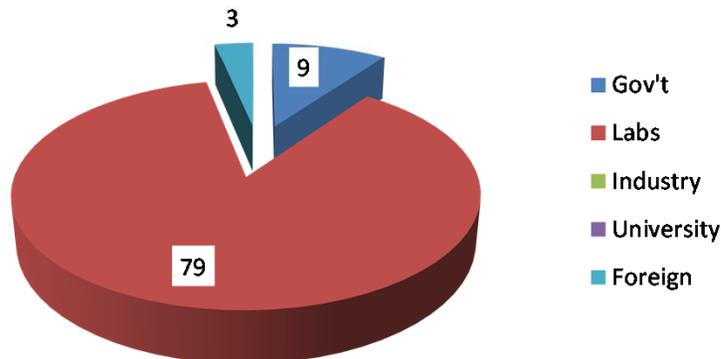


The Classes Serve a Diverse Audience

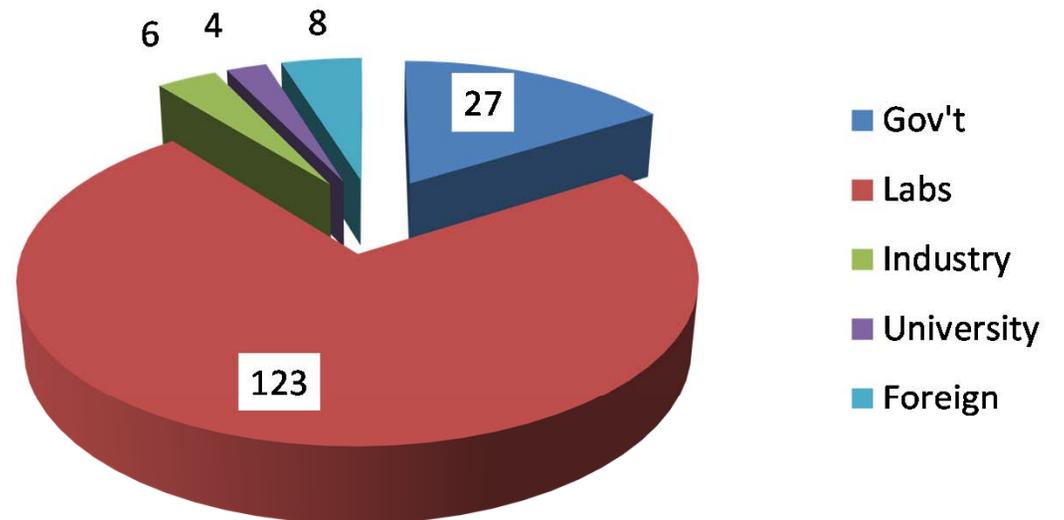
Nuclear Criticality Safety Professionals
9 Sessions, 77 Students



Nuclear Material Managers
6 Sessions, 91 Students



Both Classes
17 Sessions, 168 Students





The Sandia Classes

- **The Sandia classes are a series of four experiments**
 - Approach on fuel
 - Approach on moderator height
 - “Split table” approach
 - Fuel removal approach
- **Lectures on various subjects are integrated with the experiments**

Critical Experiments at Sandia

