Selected Projects with MCNP and Reactor Design

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Presentation Outline

- Personal introduction
- Three Selected Projects
  - Sigma Science
  - Reactor Design
  - Personnel Safety Research

Sigma Science Inc - Radiological Engineer 1

Company Background

- Over 20 years of service in nuclear national security
- Clients include: Sandia National Lab, LANL, ORNL, NNSA
  USAF Nuclear Weapons Center,
  DOE Office of Environmental Management
- My assignment: Sandia's HERMES III pulsed accelerator
  - World's most powerful gamma ray simulator
  - Produces radiation bursts similar to nuclear detonations

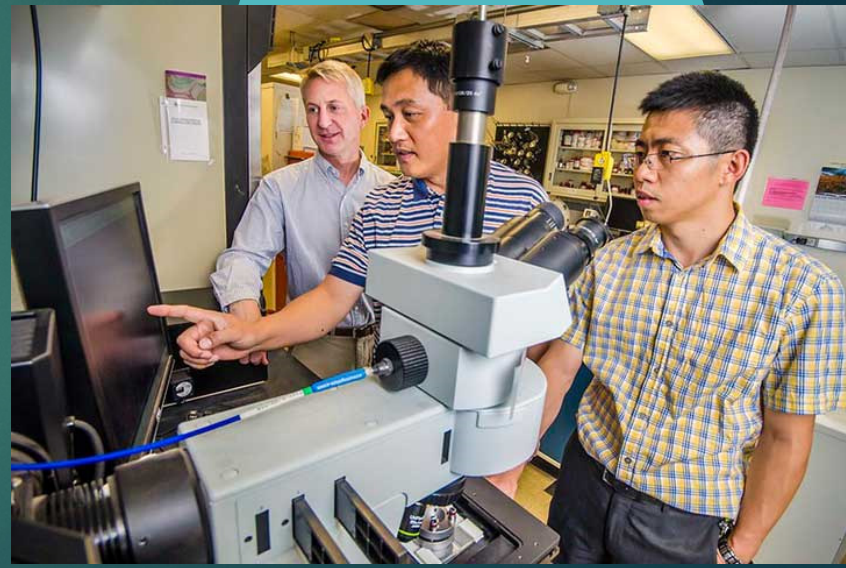


Photo credit: https://sigmasci.com/expertise/

Sigma Science Inc - Radiological Engineer 1

Personal Responsibilities

- Converted data from Sandia into source parameters for MCNP
- Simulated proposed HERMES experiments
- Developed a model that made dose predictions for test materials and the greater facility

Photo credit: https://www.sandia.gov/Pulsed-Power/research_facilities/Saturn_and_HERMES.html

Sigma Science Inc - Radiological Engineer 1

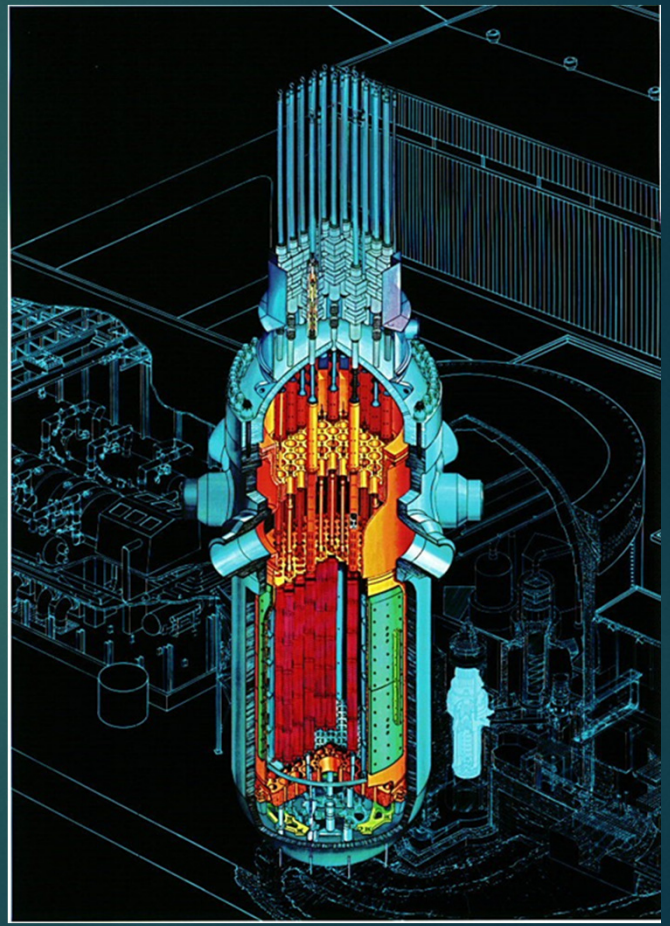
Accomplishments

- Punctual service, always met quality expectations
- Informed proposed design changes
- Revised model to optimize its time efficiency
- Validation and verification experience

Colorado School of Mines – Reactor Design

Background

- Small power producing reactor, liquid metal coolant
- purpose of consuming reprocessed actinides
- Diverse, multi-disciplinary team specialized in neutronics, core heat transfer, shielding, and isotope burnup

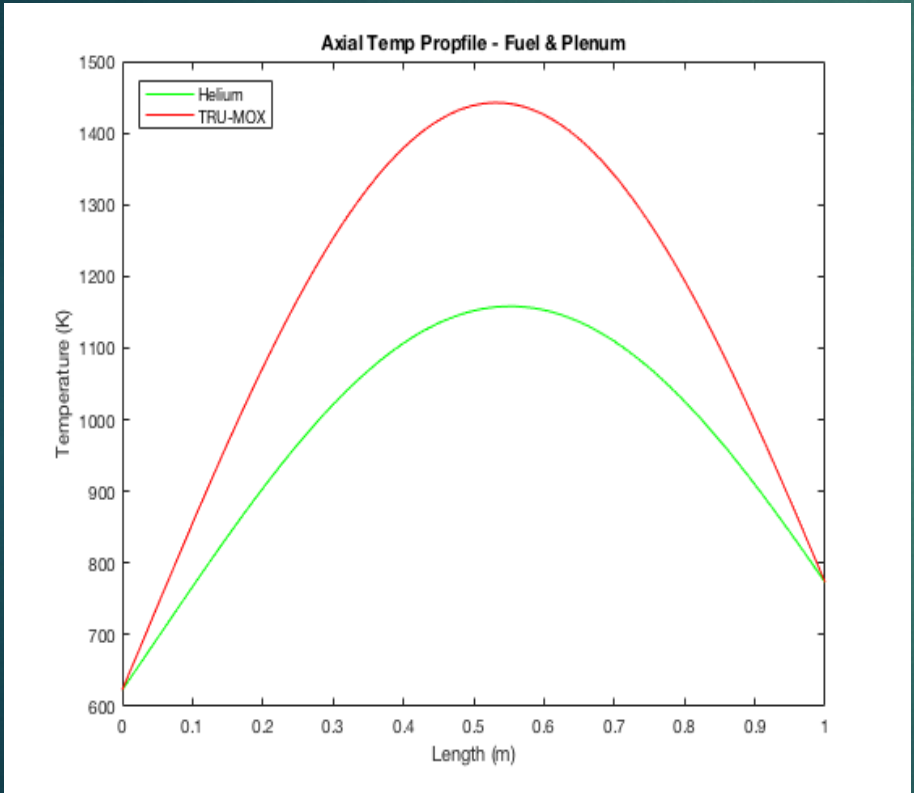


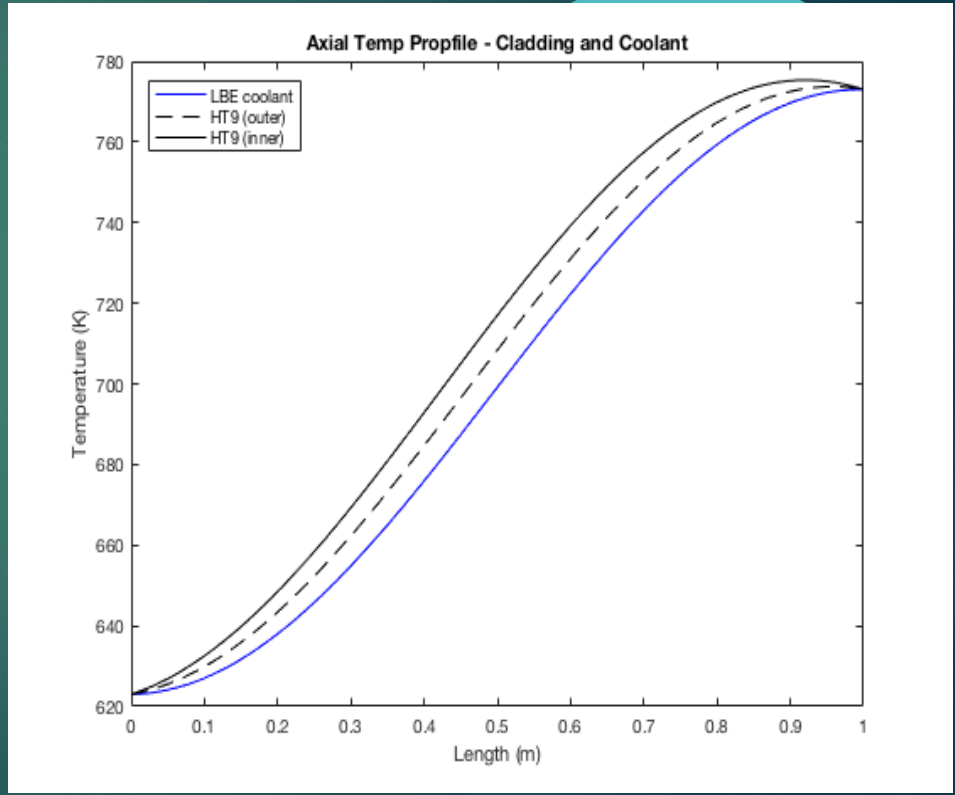
Colorado School of Mines – Reactor Design

Responsibilities

- Thermal hydraulic study of the core design
- Heat transfer analysis for proposed fuel rod designs
  - Iterative process in computing thermal power output given a particular concentration of actinides
- Led group in building system-wide model, setting regular milestones for progress
- Head of technical writing in editing final design report, and developing consistent voice

Sample Output of Fuel Rod Heat Transfer Model





Colorado School of Mines – Reactor Design

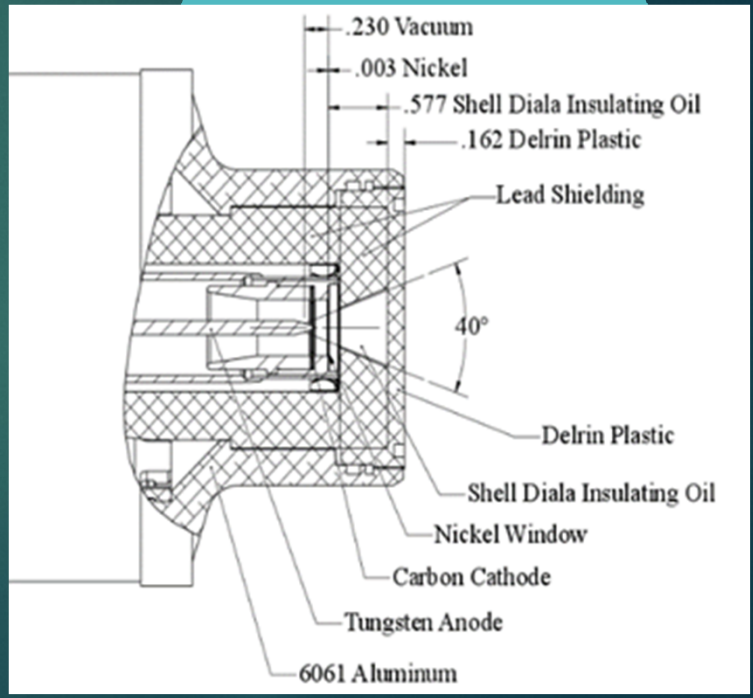
Accomplishments

- Successfully met primary goal – the net consumption of all minor actinides
- Developed big-systems thinking needed for complex design project
- Long-term exercise in building a productive team, demanded competent writing and oral communication skills
- We made an A- for the entire project

School of Mines - MCNP Research Assistant

Project Background

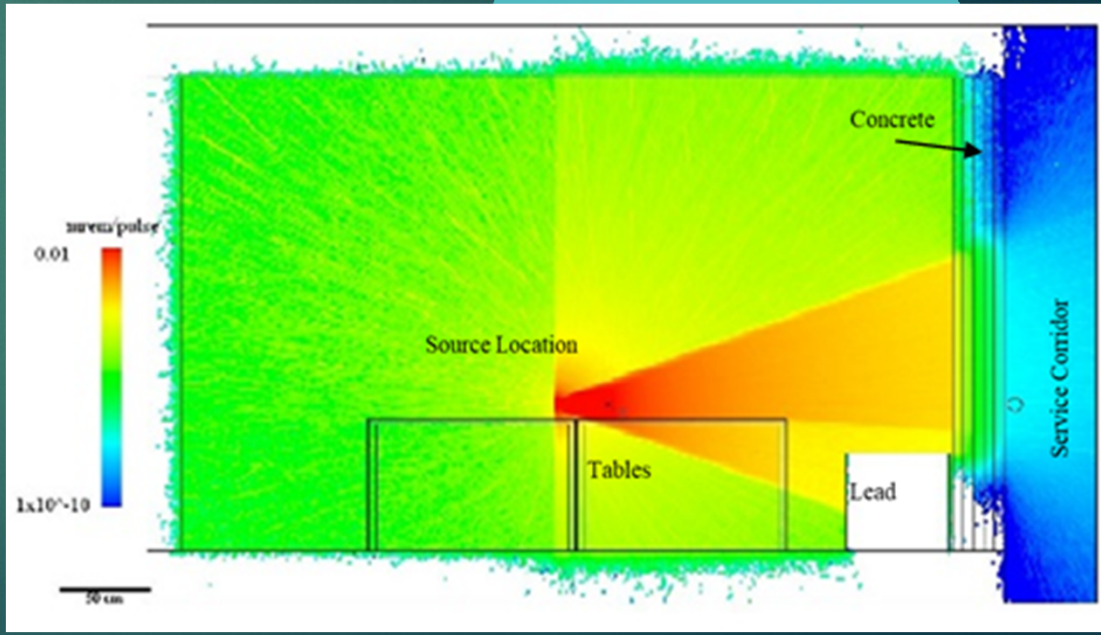
- Pulsed x-rays produced from accelerated electrons can be used for imaging and activating test materials
- Nearby service corridor is accessible to workers not associated with imaging operations
- Annual dosage rates in the corridor must be within permitted limits of 100 mrem per year



School of Mines - MCNP Research Assistant

Responsibilities

- Build facility model with MCNP, verify material compositions, integrate old code
- Standardize code format to increase user friendliness for future students
- Assist in editing final report for internal publication



School of Mines - MCNP Research Assistant

Accomplishments

- Revived a stalled project and accelerated it to completion
- These results allowed my advisor and his research group to earn approval for conducting new imaging experiments
- Determined that personnel safety standards would be upheld with proper source placement in the imaging room or with minimal wall shielding

Additional Achievements and Future Potential

- Active in American Nuclear Society
  - Trinity Chapter Executive Committee
- Passed Fundamentals of Engineering exam last week!
  - Aspire to become licensed PE
  - Provide better professional service to my future employer

American Nuclear Society
Trinity Section

Photo credit: http://local.ans.org/trinity/calendar.html

NCEES
advancing licensure for engineers and surveyors

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Questions and Discussion

Thank you!