

# 70 Years of Transportation Safety and Counting

31st INMM Spent Fuel Management Seminar

12 January 2016

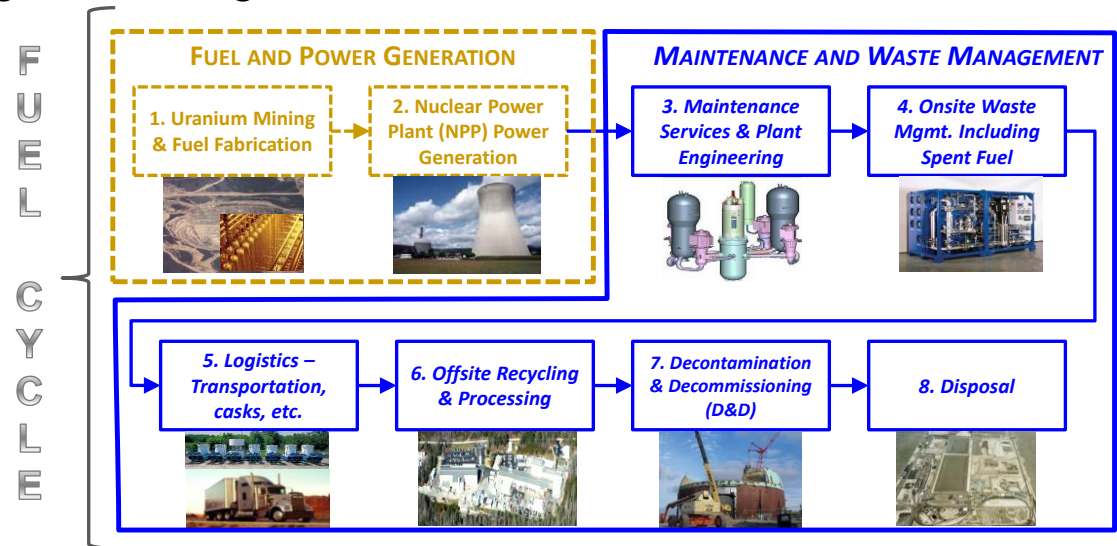
Robert



*All you need in radioactive and hazardous waste  
management*

# Who is EnergySolutions?

- EnergySolutions is a proven nuclear services and radioactive materials management company
- We operate a large fleet of Type A and B truck casks and railcars
  - Own and maintain 97 licensed Type A and B shielded shipping casks
  - Over 350 railcars
  - Specialty package design, licensing and fabrication
- Majority of our shipments are by rail
- Our truck fleet alone logs over 8 million miles per year and transports over 300 radioactive shipments per month



# Nuclear Materials Transportation

## Some Background Information

- Transportation of nuclear materials is not new or novel
  - Over 70 years of transport, going back to the Manhattan project
  - Outstanding record of safety and security
  - No member of the public has ever been harmed from a radioactive release
- Nuclear materials are transported on an ongoing basis all over the world
- Shipments made by public highway, rail, barge, ocean vessels and air



- Over 3 million packages of radioactive materials are shipped annually in the US alone
  - Average of over 8,200 per day

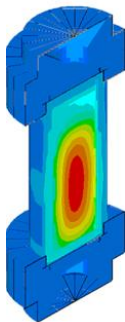
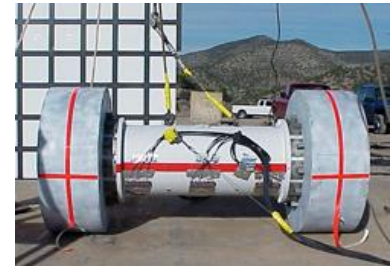
# Spent Fuel Transportation – An Enviably Record of Safety

- In the US, spent fuel shipments from commercial nuclear power plants, research reactors, and the Navy have been safely made for decades
  - The U.S. Navy has completed around 850 shipments totaling over 1.6 million miles of transport
  - Since the mid-1970's there have been over 1,300 safe shipments of commercial spent fuel in the United States
  - Between 1990 and 2012, 60 shipments including more than 250 transportation casks of foreign research reactor fuel and been shipped to and within the United States by sea, land and air
- Internationally, over 70,000 metric tons of spent fuel have been transported by road, rail and sea within and among the United Kingdom, France, Germany, Sweden, Japan, and other nations
- In all of these spent fuel shipments there has been no failure of a package and no release of radioactive materials



# Safety – It's Not an Accident!

- Comprehensive regulations govern nuclear material transportation
  - In the US, standards for transportation packages are regulated by Federal law and enforced by the U.S. Nuclear Regulatory Commission (NRC)
  - Internationally, shipments are governed by similar regulations that are promulgated by the IAEA
- History of safe transport provides evidence that these regulations are effective. Recent independent reviews agree:
  - Independent review of current international standards and U.S. regulations performed by the National Academies concluded these regulations are adequate and proven to ensure package containment effectiveness during both routine transport and in severe accidents
  - The Blue Ribbon Commission on America's Nuclear Future noted that the standards and regulations for spent fuel transportation are proven and well functioning



# Regulations vs. Reality

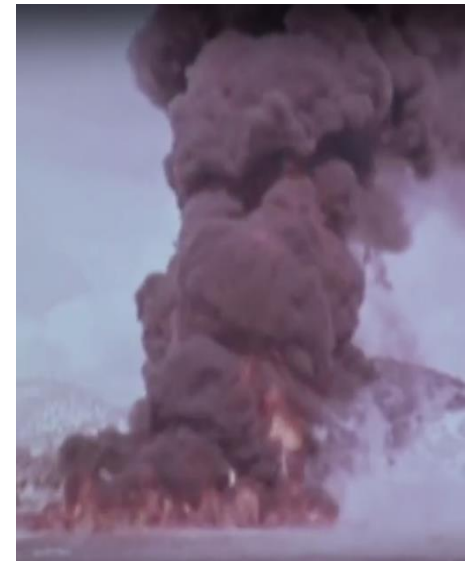
- Regulatory requirements for hypothetical accident conditions result in proven robust transportation packages
- Time and again, tests and evaluations to look at severe “real world” accident scenarios demonstrate the robustness of these packages
  - Cask impacted by high speed locomotive
  - Cask on rocket sled into solid concrete bunker
  - Cask drop from helicopter at altitude
  - Missile impact on cask
- In each of these demonstrations, the casks maintained their integrity and suffered only superficial damage





# Regulations vs. Reality *(continued)*

- Similarly, evaluations of transport packages in fire scenarios have been performed
  - Baltimore Howard Street Tunnel fire on 3 rail cask designs
  - Multiple pool fire scenarios on rail and truck casks
- Results of these evaluations demonstrate that SNF casks designed to meet current regulations will prevent the loss of radioactive material in realistic severe fire accidents



Note: more evaluations continue to be performed – 2 new evaluations by NRC of highway fire scenarios are out for public comment

# What Lies Ahead

- In the US, concerns have been expressed about the ability to handle and manage the transport of spent fuel from reactor sites to a central storage or disposal site
- The number of packages to be transported, and the number of shipments, are dependent upon the packages and transport mode used
- DOE has determined a mostly rail approach, shipping about 3,000 MTU per year
- In current sized rail casks, result is ~300 packages per year
  - Dedicated train with 3 packages is 100 shipments / year, or about 2 per week





# What Lies Ahead *(continued)*

- In current sized rail casks, result is ~300 packages per year
  - Dedicated train with 3 packages is 100 shipments / year, or about 2 per week
- This represents only 0.01% of the total radioactive waste packages shipped in the US per year



# Conclusions

- The history of nuclear materials and spent fuel transportation demonstrates a commendable record and history of safety
- In more than 70 years of nuclear materials transport in the US and worldwide, no member of the public has ever been harmed from a radioactive release
- This is a testament to the effectiveness of the regulatory requirements and processes, which are adequate and well proven, and the industry's implementation of the regulatory requirements in partnership with regional and local governments
- Shipment of SNF from plant sites to a centralized location is not an overwhelming challenge, and in fact represents on a minimal increase in the annual shipments of radioactive materials



**ENERGY** *SOLUTIONS*