U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Current Functions and Capabilities of DOE's Stakeholder Tool for Assessing Radioactive Transportation (START)

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Disclaimer

This is a technical presentation that does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, spent nuclear fuel in multi-assembly canisters is not an acceptable waste form, absent a mutually agreed to contract amendment.

To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this presentation in no manner supersedes, overrides, or amends the Standard Contract. This presentation reflects technical work which could support future decision making by DOE. No inferences should be drawn from this presentation regarding future actions by DOE, which are limited both by the terms of the Standard Contract and Congressional appropriations for completing a spent nuclear fuel repository.

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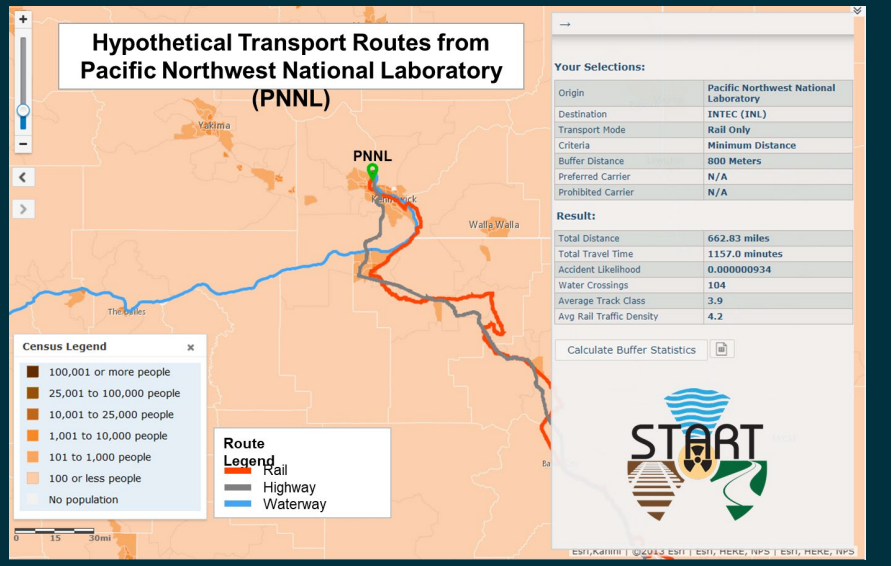
What is START?

The Office of Integrated Waste Management's web-GIS transportation decision-support tool developed to enable visualization and analyses of geospatial data relevant to planning and operating large-scale spent nuclear fuel and high-level radioactive waste transport to storage and/or disposal facilities.

Development History

- **Fall 2014**: First START version published, hosted by Idaho National Laboratory (INL)
- **Summer 2018:** Began exploring options to move hosting onto a cloud server
- **Spring/Summer 2019:** DOE procured GIS software licenses for cloud server
- **Spring 2020:** DOE Office of the Chief Information Officer (OCIO) indicated they were ready to host START, but shortly after other tasks took priority
- **Fall 2020:** Security changes to INL server systems
- **Spring 2021:** Discussions with OCIO resumed with a path forward
- **Fall 2021:** Cloud accounts procured for DOE-NE, security reviews began
- **Winter 2022:** Migration of START to DOE-HQ cloud server in process
- **Spring 2022:** Expect to have a production version of START up and running at DOE-HQ

Program Utilization



- **Routing Options & Risk Attributes**
  - Rail, highway, waterway, intermodal
- **Training Preparations Along Routes**
  - Fire & police stations, hospitals
  - DOE TEPP* trained personnel
- **Communications**
  - Visualize transportation networks relative to nuclear plants and DOE sites
- **Environmental Analyses**
  - Transportation dose estimates
- **Integration With Systems Analysis**
  - Provides inputs to NGSAM

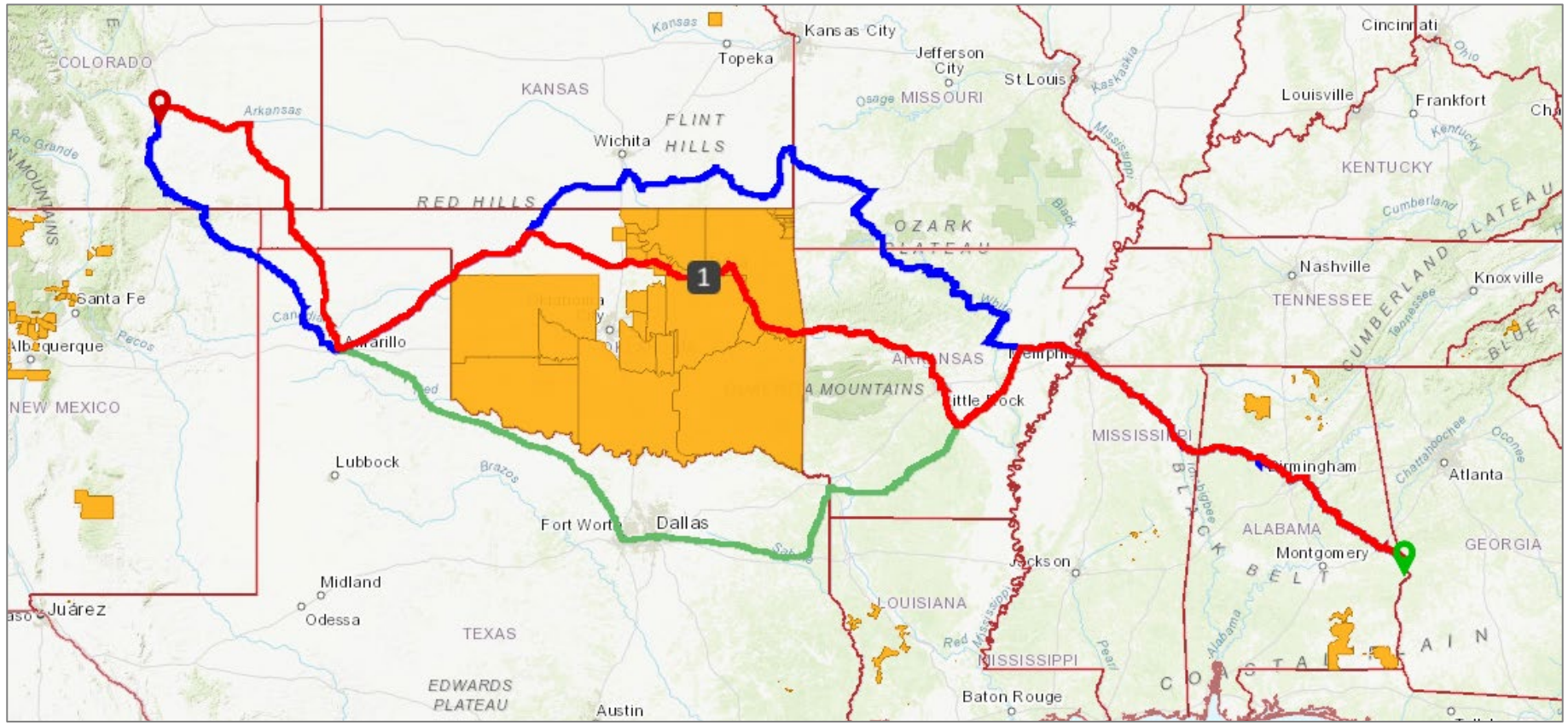
*Transportation Emergency Preparedness Program (TEPP)

Example: Route Evaluation

min tt

min tt (through Tulsa)

min pop



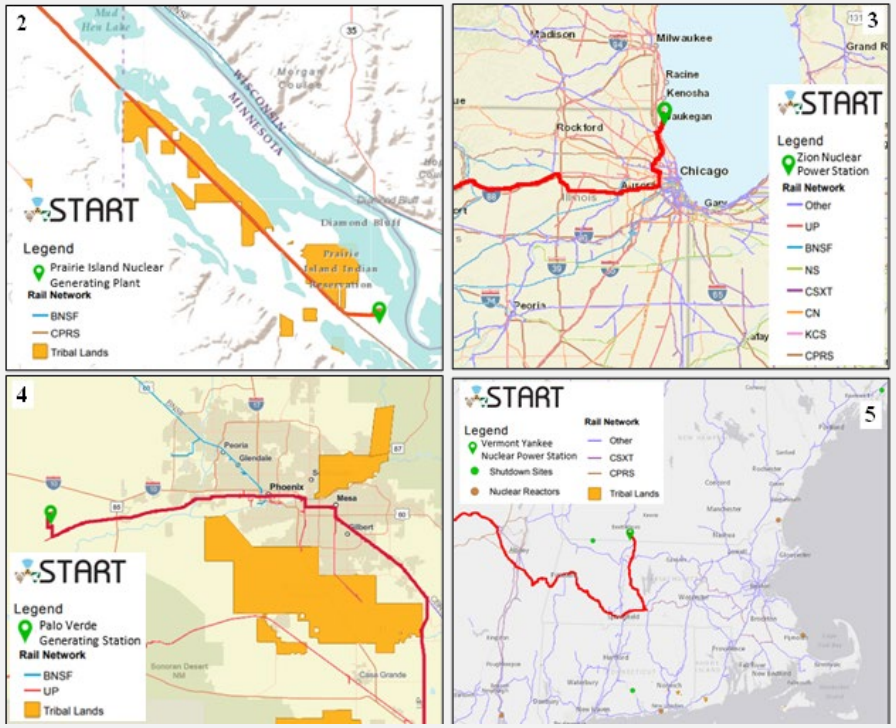
*** Example routes are for illustrative purposes only and do not reflect a selected destination site.**

Route Evaluation Results

Routing Criteria	Min. Travel Time	Min. Population	Min. Travel Time (through Tulsa)
Buffer Distance	800 Meters	800 Meters	800 Meters
Result:			
Total Distance	1608.04 miles	1775.10 miles	1609.38 miles
Total Travel Time	2132.6 minutes	2935.7 minutes	2217.7 minutes
Accident Likelihood (per mile)	0.000000451	0.000001065	0.0000005
Water Crossings	142	147	121
Average Track Class	3.9	3.5	3.9
Avg Rail Traffic Density	5	3.8	4.9
Average Population Density	389.1	202.6	308.2
Total Population (within buffer)	590047 persons	323740 persons	462304 persons
Mass Gathering Places	1019	730	904
Tribal Lands	0 square miles	3.58 square miles	203.43 square miles
Sensitive Environmental Areas	183.8 square miles	147.48 square miles	166.14 square miles
Tunnels	2	5	3
Emergency Response Capability (per mile)	0.21	0.16	0.21
Educational Institutions	336	238	285
Special Age Groups	473	282	449
Railroad Crossings (at grade)	1620	1460	1645

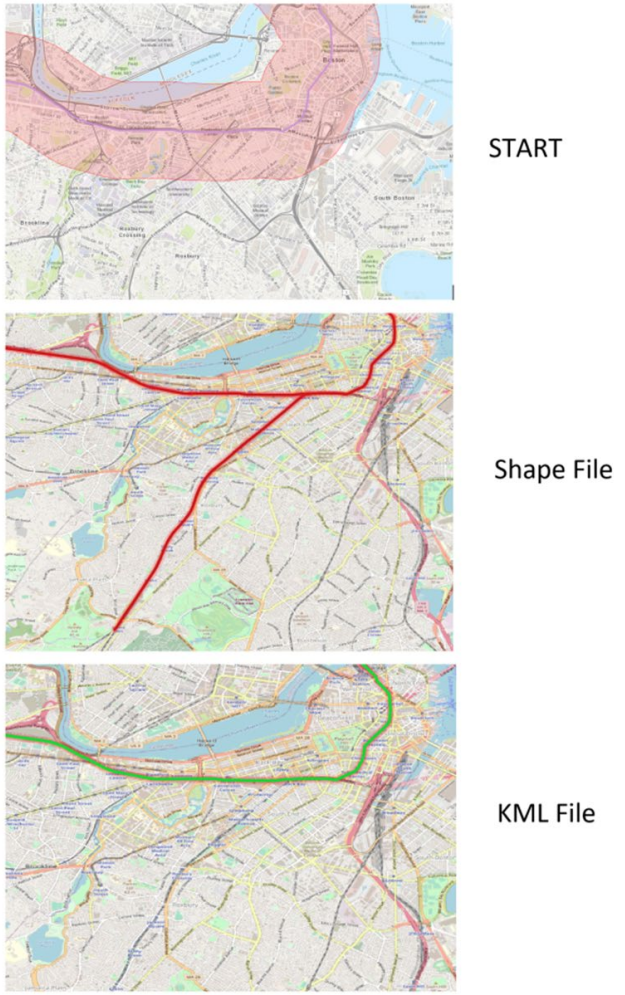
*** Example routes are for illustrative purposes only and do not reflect a selected destination site.**

Validation



- **Rail Routing Workshop**
  - DOE's National Transportation Stakeholders Forum Rail/Routing Ad Hoc Working Group
  - Rail carriers from UP, BNSF, CSXT, and KCS
- **Outcome**
  - Routes generated using START compared well with rail carrier routes using industry's Rail Corridor Risk Management System (RCRMS)
  - Population buffer - 800m for START vs 322m for RCRMS
  - Operational differences – North/South track
  - Weighting security and safety risks - RCRMS gives equal weight, though historically rail incidents have been caused by safety issues

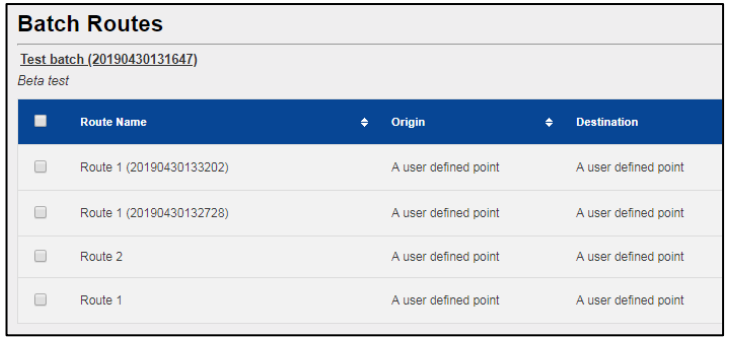
Validation cont.



- **Verification & Validation**
  - Pacific Northwest National Laboratory
  - Check START outputs against independent assessments in ArcMap and QGIS
    - route buffer zone population and population density
    - route distance
- **Outcome**
  - In all test cases, the route buffer zone population and route distance showed good agreement between START and the test cases.
    - The percent difference was within 5% in all cases, with most cases under ±1%.

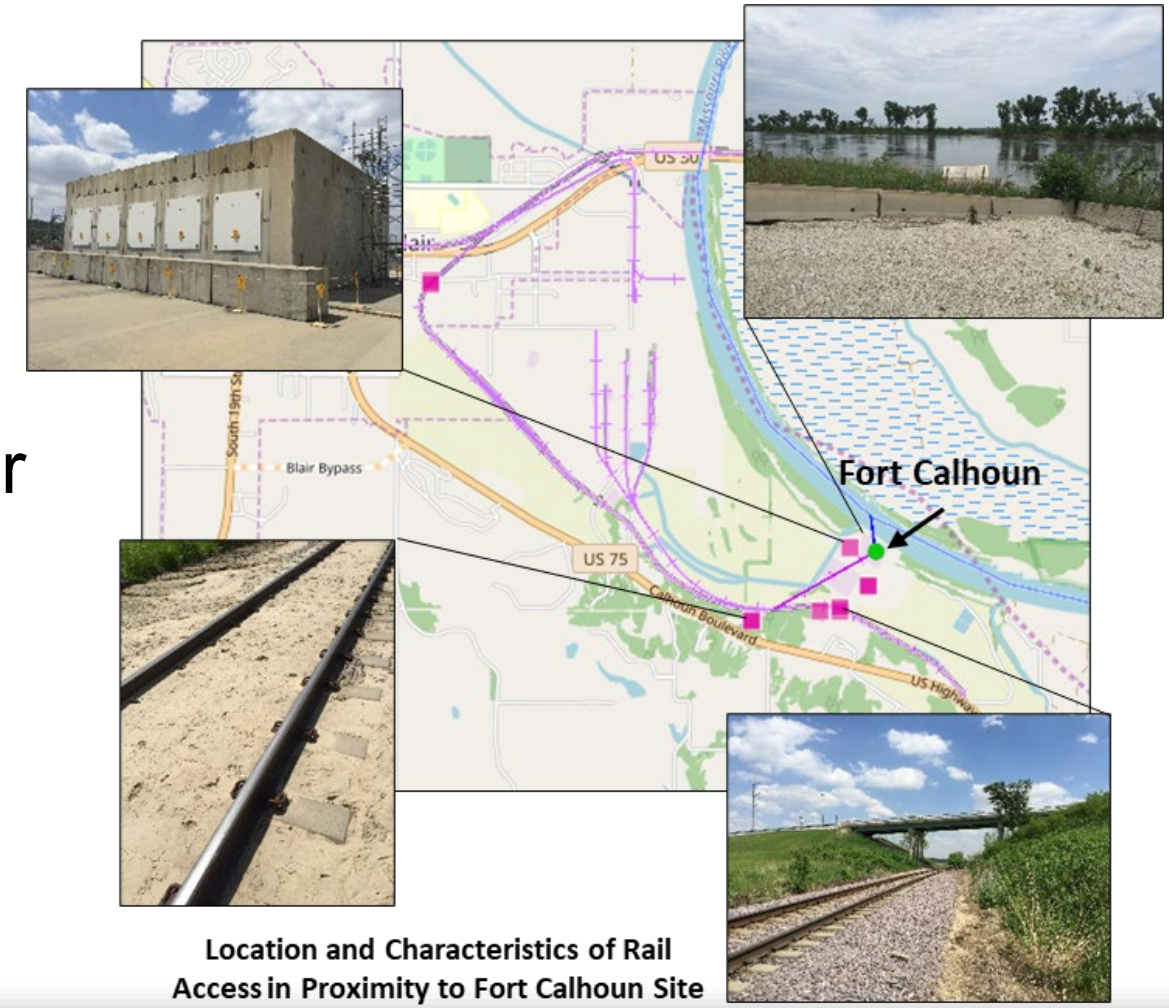
Recent Improvements

- **Added new ESRI ArcServer features as available**
- **Batch routing capability**
- **Incident-free dose rates**
  - Crew, off-link public, on-link highway public available
  - Displayed in route summaries as percent of background
- **Continuous routing logic improvements (~quarterly)**
- **Route assessment results by jurisdictional boundary (e.g., State, Tribal, county)**
- **Continuous data updates (6-12 month intervals)**
  - Created hybrid highway network layer
- **Ongoing verification & validation**
  - Now using LandScan population data for dose
  - Resolving aberrations in exported route shapefiles



Challenges

- Data Quality & Coverage
  - Fire Stations
  - Rail Network Currency
- Rail routing
  - More complex than highway or waterway
- Manual addition of data
  - Transload points
  - Geocoded site photos
  - High Threat Urban Areas



Location and Characteristics of Rail Access in Proximity to Fort Calhoun Site

Future Work

Photo credit: Connecticut Yankee

- **Maintain data currency**
  - Update geocoded photo layers
- **Virtual Trainings for Tribal & State partners**
- **Continue Verification & Validation Work**
- **Utilize cloud platform code diagnostics**
- **Continue developing NEPA-related support functions**
  - More conditions for dose estimates
- **Improve integration with systems tools**
- **Create suite of use cases to support DOE activities**
- **Consider other applications for analysis**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START - For Official Use Only

Username (Your Email Address)

Password

Log in

OFFICIAL USE ONLY

May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552), exemption number and category: 7, Law Enforcement Information .

Department of Energy review required before public release

Name/Org: Jeff Garner/M-310 Date: 08/14/2014
Guidance (if applicable) CG-SS-4

Register if you don't have an account.

Forgot your password?

Potential Transload Sites	Schools	Highway Hazmat Route Registry
Nuclear Reactors	Colleges/Universities	DOE WIPP Highway Routes
Shutdown Sites	Day Care Centers	U.S. Navy Spent Fuel Rail Routes
DOE and Other Facilities	Nursing Homes	Parks
Fire Departments	Rail Network	National Forests
TEPP Trained Personnel	Rail Freight Stations	Federal Lands
Police	Rail Junctions	Military Bases
Hospitals	Rail Crossings	Hazard Threat Urban Areas
State EOCs	Rail Yards	Surface Water Areas
Advance Notification Designees	Rail Bridges	Tribal Lands
Theme Parks and Zoos	Rail Tunnels	Congressional Districts
Casinos	Highway Network	States
Performing Arts Centers	Highway Bridges	State Legislative Districts
Stadiums and Arenas	Navigable Waterway Network	Counties
Malls	Locks/Dams	City Limits
National Monuments/Icons	Water Terminals	Urban Areas
Places of Worship	Coast Guard Districts	
Airports	Captain of the Port Zones	Transportation Infrastructure Photos