

FTOT 2024.1

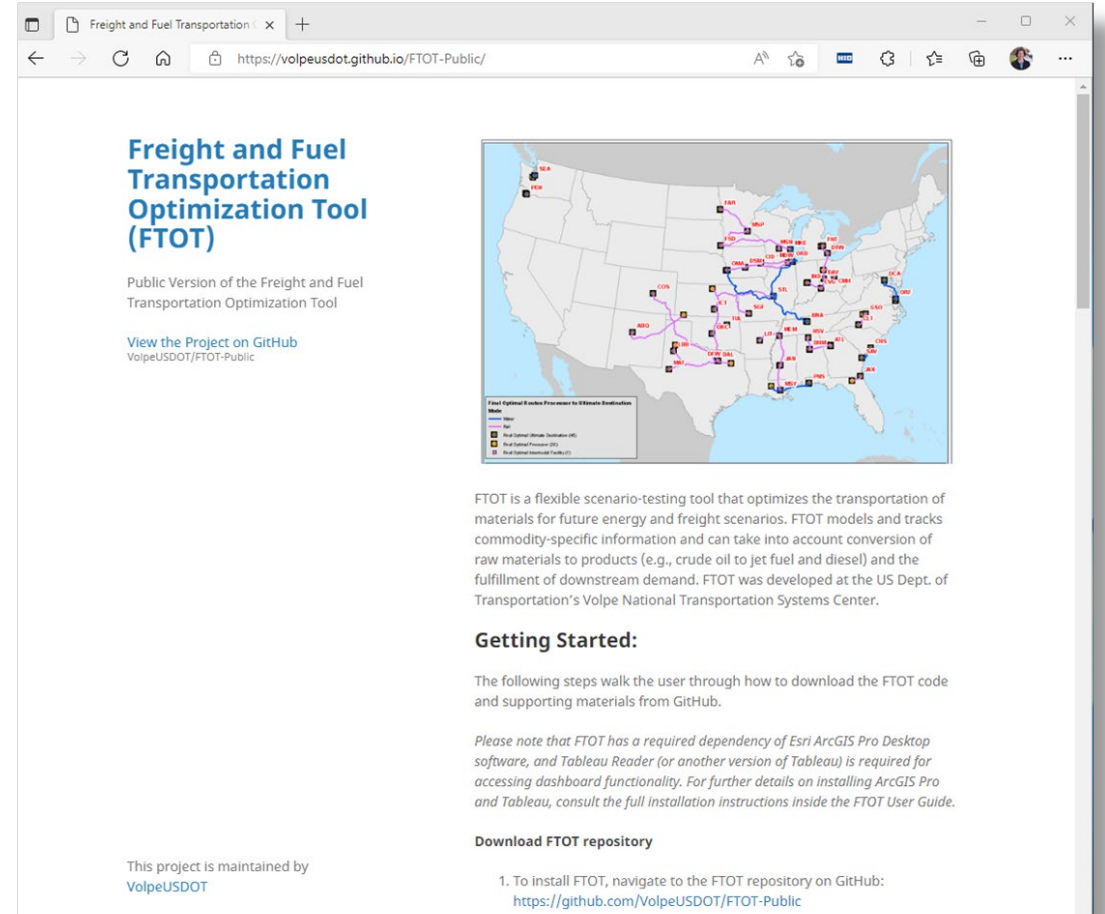
Users Group Meeting

April 22, 2024

FTOT Landing Page

Download the latest release:
volpeusdot.github.io/FTOT-Public

- FTOT is an open-source tool available on GitHub.
- Includes full documentation and “Quick Start” scenarios, default datasets, video tutorials.
- Updated versions released quarterly.
- Issues / bugs / requests can be raised on GitHub site.
- We welcome feedback and suggestions, additional projects, collaborations.
- Email FTOT-Team@dot.gov.



Agenda

- 2024.1 Release
 - Network updates
 - Updated pipeline network and tariff data
 - New locks capacity functionality
 - Updated modal base transport costs from BTS
 - Redesigned routes dashboard in Tableau
 - Renamed Scenario Setup Template and tutorial video
 - Updated FTOT link rank and removal tool
 - Other updates
 - FTOT Tools bat file
 - Back-end improvements and bug fixes
- Example Demo: FTOT Link Rank and Removal Tool

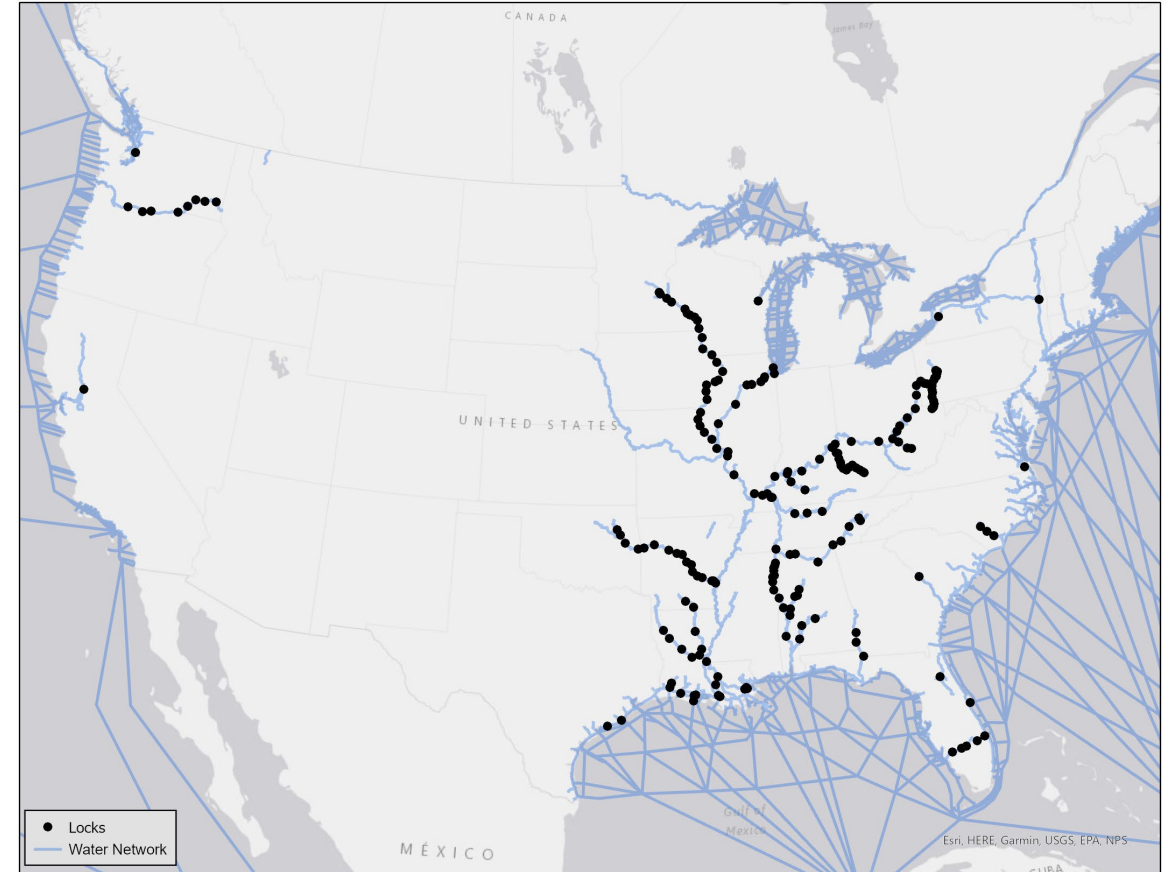
Updated: Default FTOT pipeline network

- Crude and product pipeline networks and associated tariff costs updated—effective as of January 2024 (old data were from 2021).
- Tariff costs are sourced from [Arbo](#) and have been rounded per our data use agreement.
- Custom pipeline network is derived from EIA's [public pipeline networks](#), modified based on Arbo station location data and Volpe research.
- Broader North American network (available on request) now includes some limited Alaskan and Canadian pipeline tariffs where data were available.



New: Waterway capacity considerations

- Updated optimization problem to enable use of lock volumes, capacity, and volume / capacity ratio attributes.
- Lock data are applied to adjacent waterway links when capacity and / or background flows are enabled for the water network.
- Waterway volume and capacity data can still be added directly to the water feature class.
- Added a “locks” feature class schema to the FTOT network specification and improved documentation to clarify how waterway capacity and background volumes can be applied to the network.



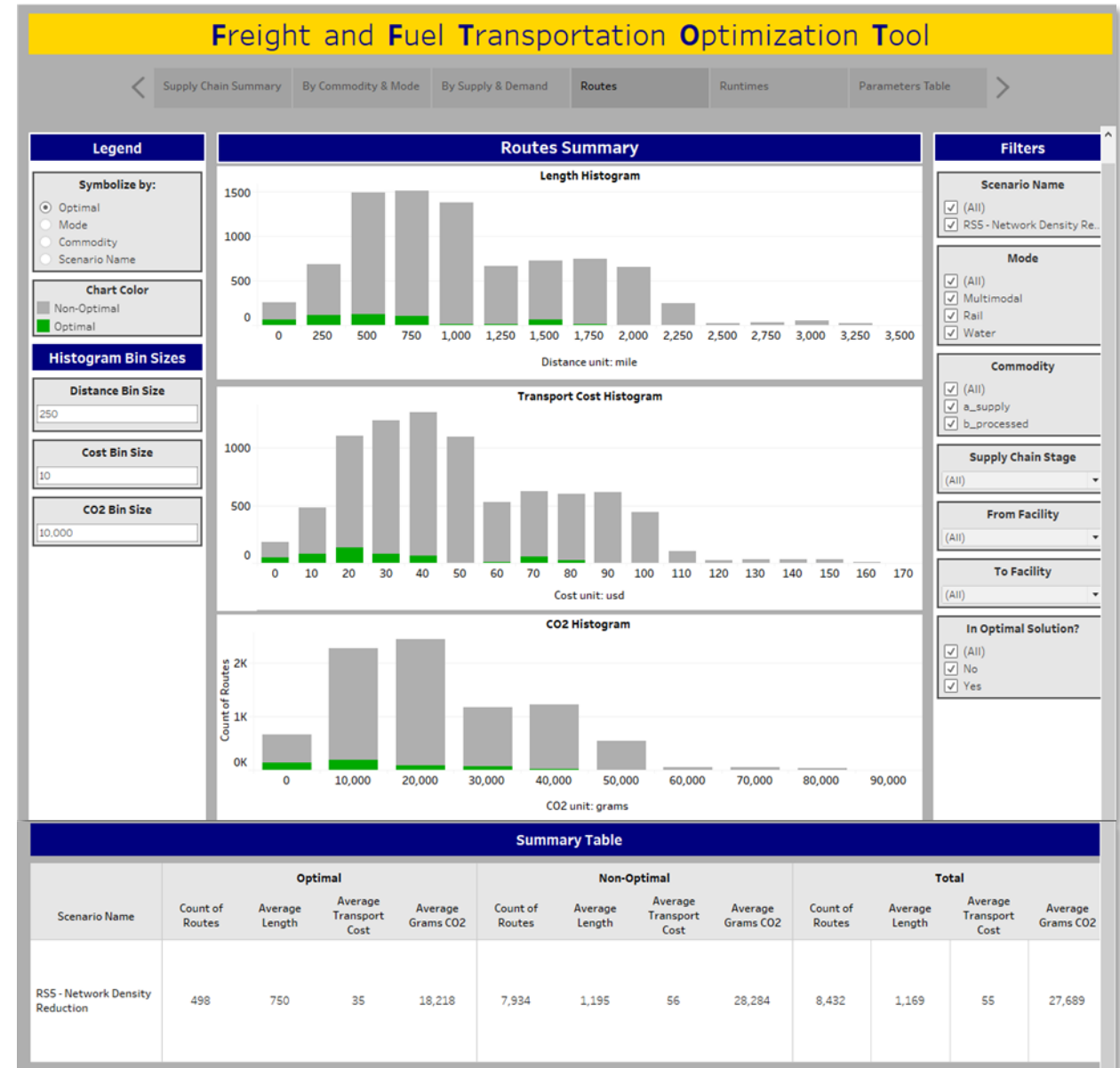
Updated: Modal base transport costs

- Refreshed default base transport costs for road, rail, and water modes
- Aligned with 2020 values from BTS – most recent year with complete data
 - [BTS Average Freight Revenue per Ton-Mile](#)
- Values have been updated in the XML template as well as all Quick Starts and Reference Scenarios

FTOT Version	Road		Rail		Water	
	Solid (\$/tonne-mi)	Liquid (\$/kgal-mi)	Solid (\$/tonne-mi)	Liquid (\$/kgal-mi)	Solid (\$/tonne-mi)	Liquid (\$/kgal-mi)
2021.4	0.22	0.66	0.047	0.14	0.032	0.097
2024.1	0.21	0.64	0.048	0.15	0.032	0.098

Updated: Tableau routes dashboard

- Provides information on shortest paths between every possible origin-destination pair in the supply chain
- Histograms show number of routes in different length, cost, and CO₂ bins
- **Newly incorporates CO₂, plus other minor enhancements**



Renamed: Scenario Setup Template and Scenario Setup Conversion Tool

- User-friendly tool to turn scenario data into FTOT input files
- Template is included in the FTOT codebase:
 - C:\FTOT\program\tools
- Process
 1. **Complete Scenario Setup Template** with supply chain data and scenario settings
 2. **Run Scenario Setup Conversion Tool** to convert template into FTOT input files → creates a .bat file, scenario XML, and facility-commodity CSVs*
- FTOT 2024.1 expands input validation
- Tutorial video explaining how to fill out the template and run the conversion tool available on [FTOT landing page](#)

Freight and Fuel Transportation Optimization Tool (FTOT) Scenario Setup Template

The Freight and Fuel Transportation Optimization Tool (FTOT) is a flexible scenario-testing tool that optimizes the transportation of materials for future energy and freight scenarios. FTOT was developed at the U.S. Department of Transportation's Volpe National Transportation Systems Center.

The **FTOT Scenario Setup Template** is a user-friendly helper tool to assist FTOT users in setting up new scenarios. Each copy of this template should be updated to reflect input data for a single scenario. When complete, the template can be used as input to the "Scenario Setup Conversion" tool in the FTOT Tools suite, which in turn will output a new scenario directory with (1) the facility-commodity CSV files representing the scenario's supply chain, (2) the scenario XML file with all scenario settings, and (3) the batch file needed to execute the FTOT program.

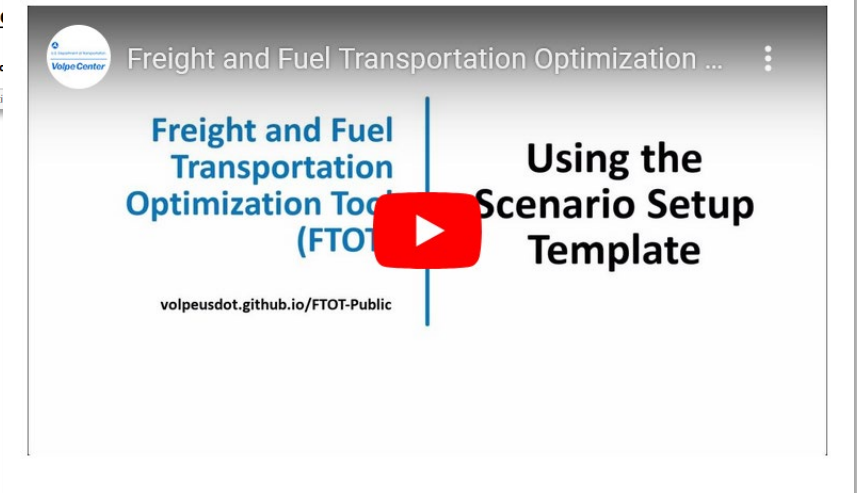
Note: The template is currently designed for simple supply chains and does not create optional input files needed for more advanced scenarios, such as scenarios using pipelines, disruption scenarios, or scenarios with facility production schedules. The supplementary CSV files for those advanced scenarios should be created outside of this template. The template also does not create the facilities GIS data required as input by FTOT. Refer to the FTOT documentation and quick start/reference scenarios for more guidance.

Running the Scenario Setup Template:

Instructions for the FTOT S

1. Create a copy of this template file. Give it a c

Instructions Configuration Commodity



*Currently does not create required GIS inputs or optional CSV files

Other Updates

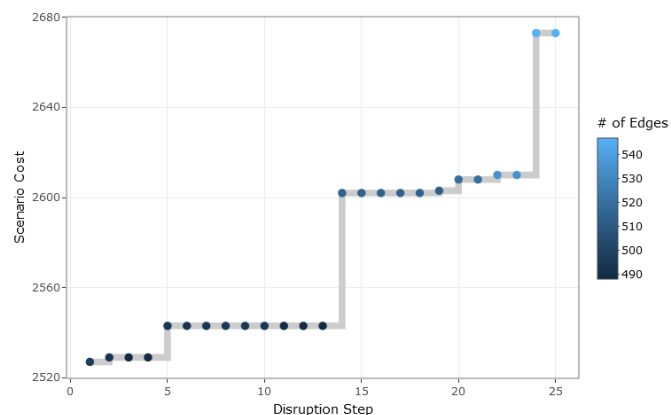
- Created an FTOT Tool bat file for easier launching of tool suite
- Back-end improvements
 - Changed FTOT network conversion step from ArcGIS to NetworkX to read directly from GDB instead of creating temporary shapefiles
 - Removed ArcGIS dependency in multiprocessing step that was causing license access issues
- Tableau updates
 - Corrected scenario comparison dashboard to incorporate CO₂ reporting on routes
 - Removed “network used” metric from Tableau dashboard to ensure consistency across reports

Upcoming: Link rank and removal tool

- [Repository](#) updated to align with FTOT version 2024.1
- Refactored Jupyter notebook
- Updated HTML report

Scenario Cost by Disruption Step

The graph below presents total scenario cost (or optimization objective value) versus the disruption step. At each step, another road link is removed. For example, in the first disruption step, the most important road link is removed from the network. In the second disruption step, the second most important link is removed, and so on. The color of the points corresponds to the number of roadway links (edges) remaining in the network after each disruption. Scenario costs will remain the same or increase with each successive disruption but should never decrease.



Maps

The maps below show the optimal road network in the baseline scenario and highlight up to 10 links by importance ranking or total scenario cost.

The map below plots the optimal route in the baseline scenario and highlights the top ten links by importance. Hover over each highlighted link to see its Net Source OID (link identifier) and rank.



Questions and Feedback on FTOT 2024.1

Demo: FTOT Link Rank and Removal Tool