



GIS Visualization of Transportation Energy Consumption

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Visualization in Transportation Symposium

Washington, D.C.

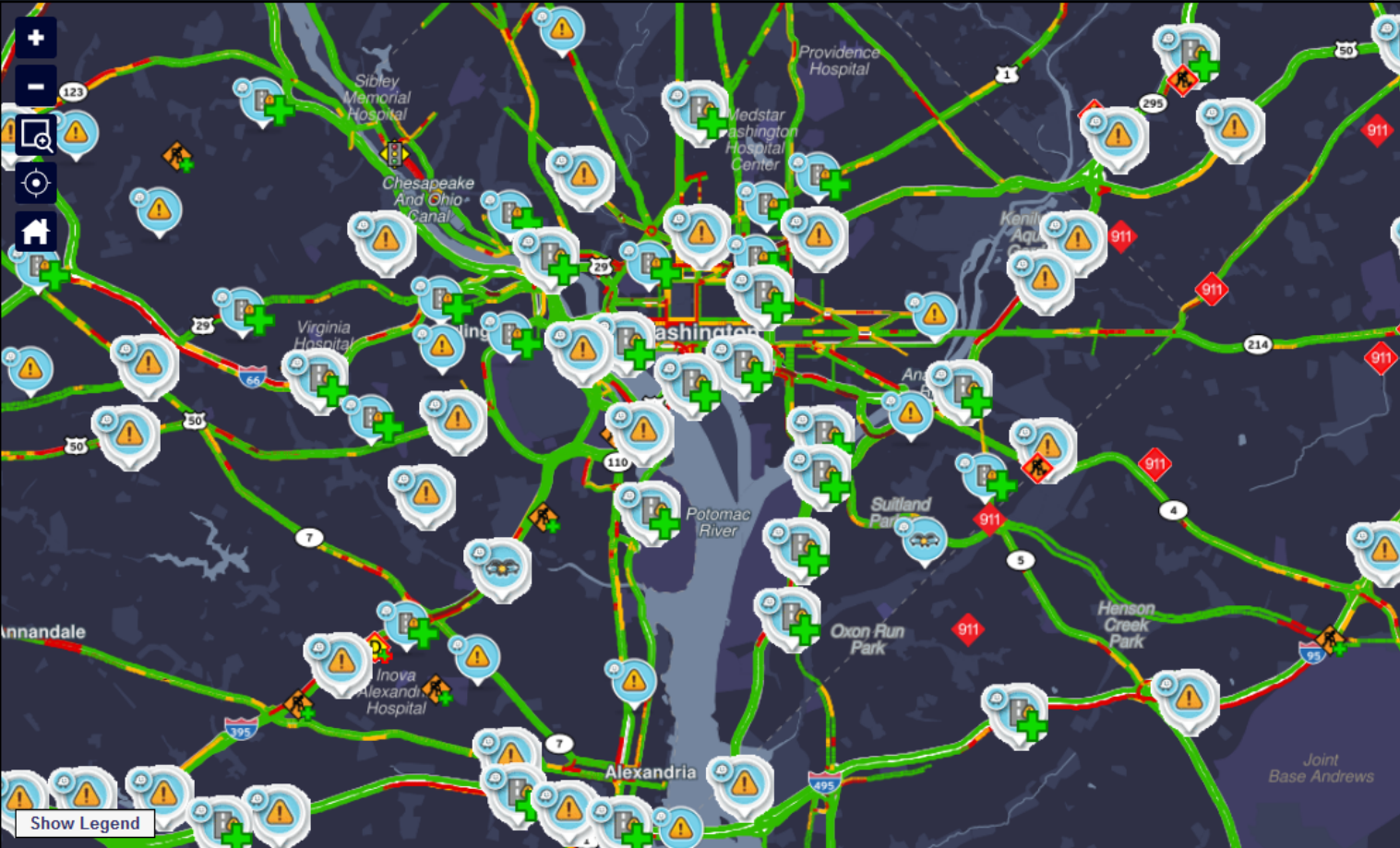
11/06/2019

Research Objectives

- Integrate novel energy-based metrics into a transportation toolset
- Use this toolset as the basis for an energy analysis dashboard
- Key questions:
 - What is an effective way to quantify transportation energy consumption, given evolutions in vehicle technology?
 - How is this information best disseminated for transportation analysts and planners?
 - How to best visualize transportation energy consumption?

Background

- Several transportation dashboards already exist, such as Regional Integrated Transportation Information System (RITIS), and the Freeway and Arterial System of Transportation (FAST) dashboard . However, few focus on energy specific metrics.
- In response, Univ. of Maryland's CATT Laboratory, NREL, and other partners initiated the Transportation Energy Analytics Dashboard (TEAD) project.



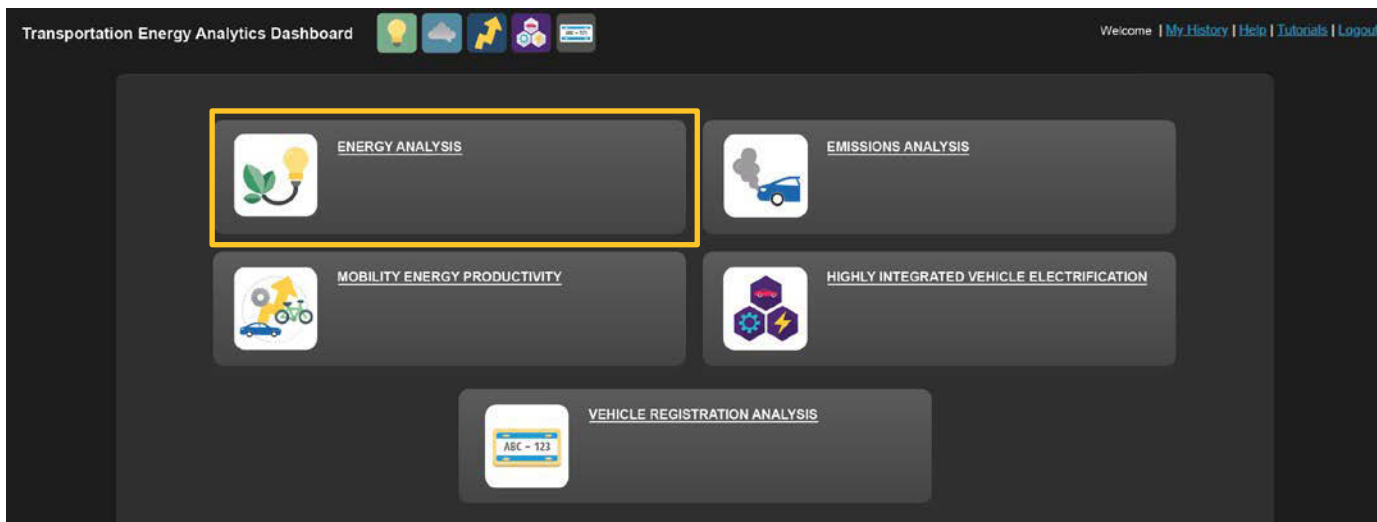
Hide Layer List

- Future Events
- Incidents and Events
- Dynamic Message Signs
- Traffic Detectors
- Traffic Cameras
- Road Weather
- Radio Scanners
- FITM Plans
- Montgomery County
- Evacuation Support
- Fleets
- Points of Interest
- Weather Alerts
- Metro Routes
- Weather Radar
- Probe Speed Data

[Show Unmapped Incidents](#)

TEAD Overview

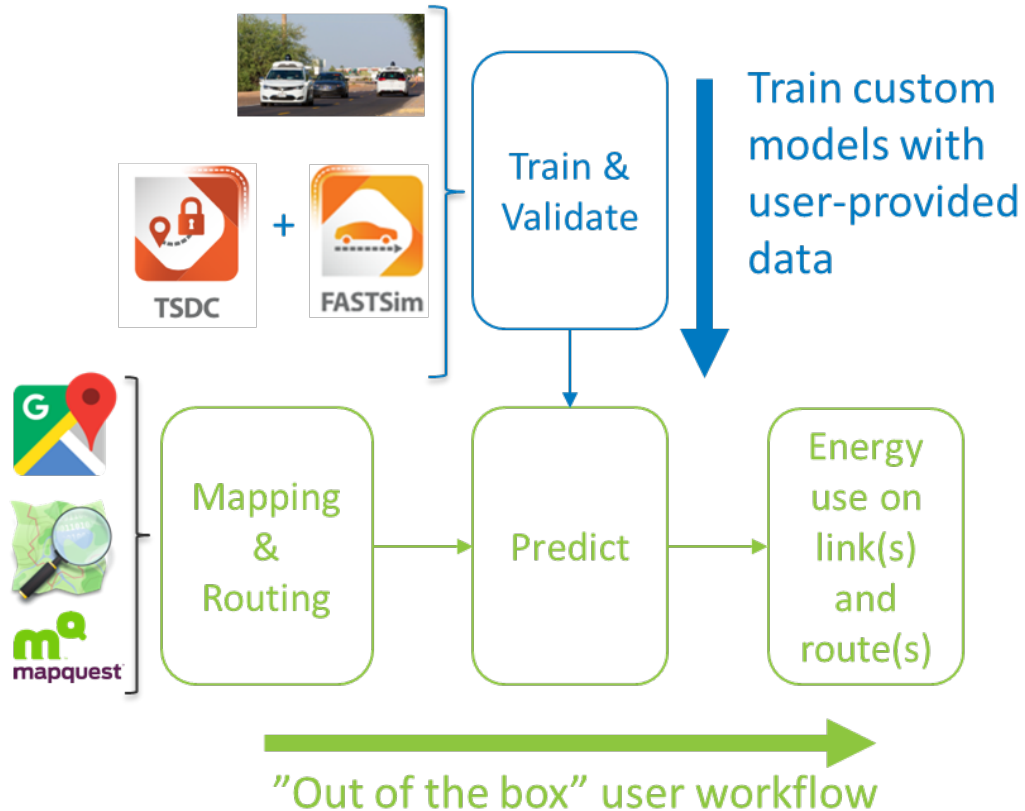
- Integrate energy metrics into RITIS to enable energy visualization and analysis.
- NREL's Route Energy Prediction Model (RouteE) is the backend engine for TEAD's transportation energy analysis widget, named RouteE Application for Transportation Energy Consumption (RATE-C).



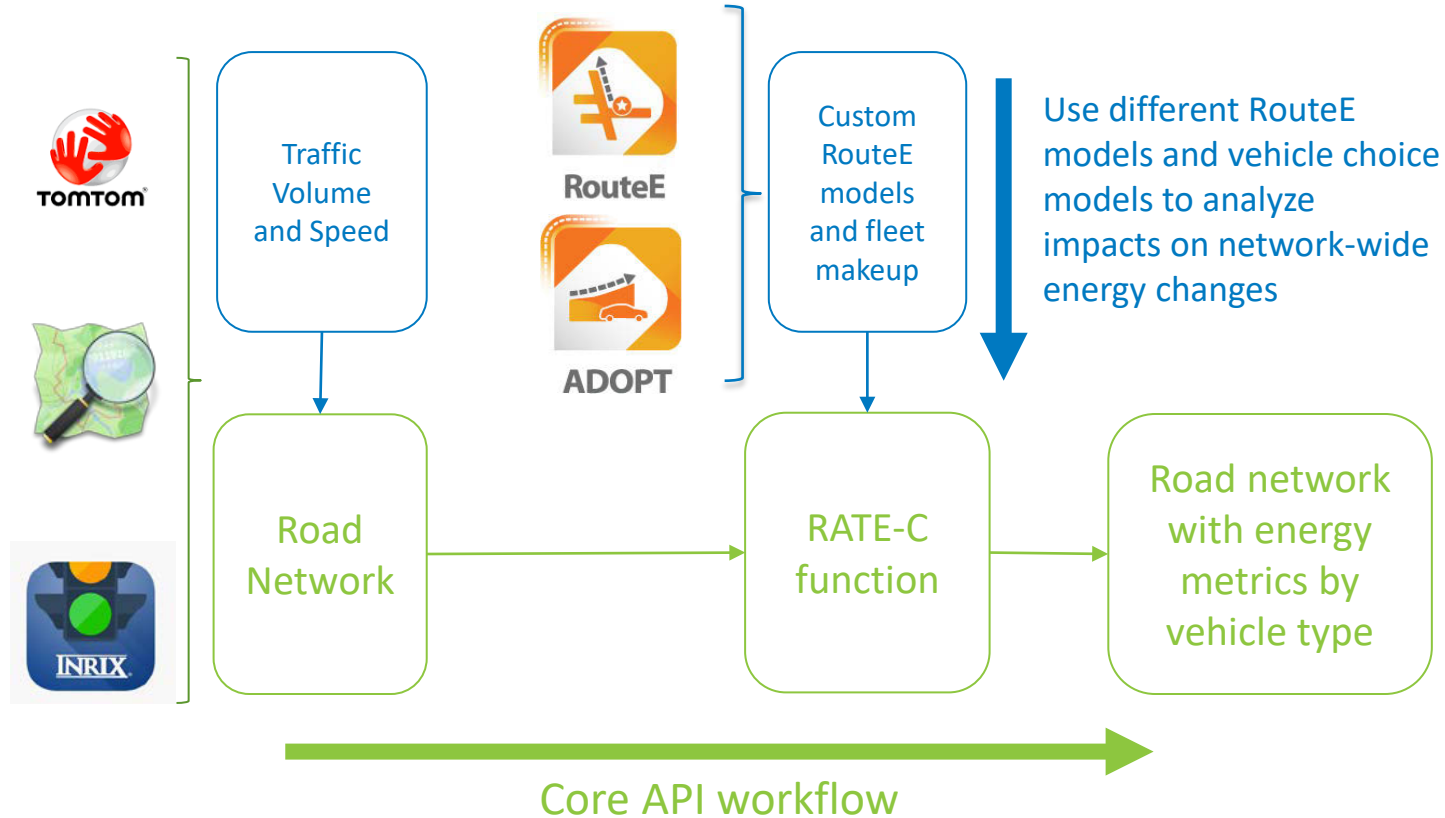
RouteE Overview



RouteE



RATE-C Overview



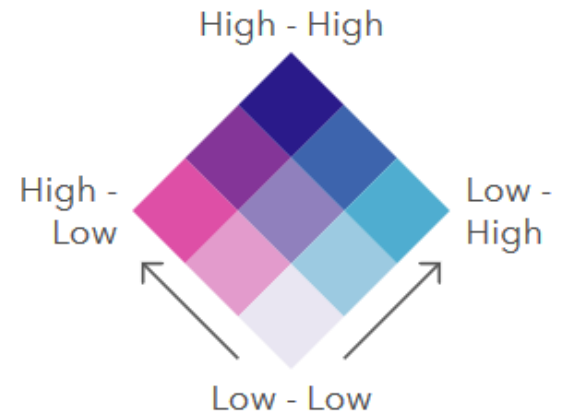
Symbology

- Relationship symbology identifies zones of:
 - Higher efficiency (left, pink)
 - Lower efficiency (right, blue)
 - General high-volume areas (top, violet)

Relationship

↖ Total Energy

↗ Average Energy Per Vehicle



Total Energy



2,602,538 GGE

Total Energy by FRC Energy by Speed

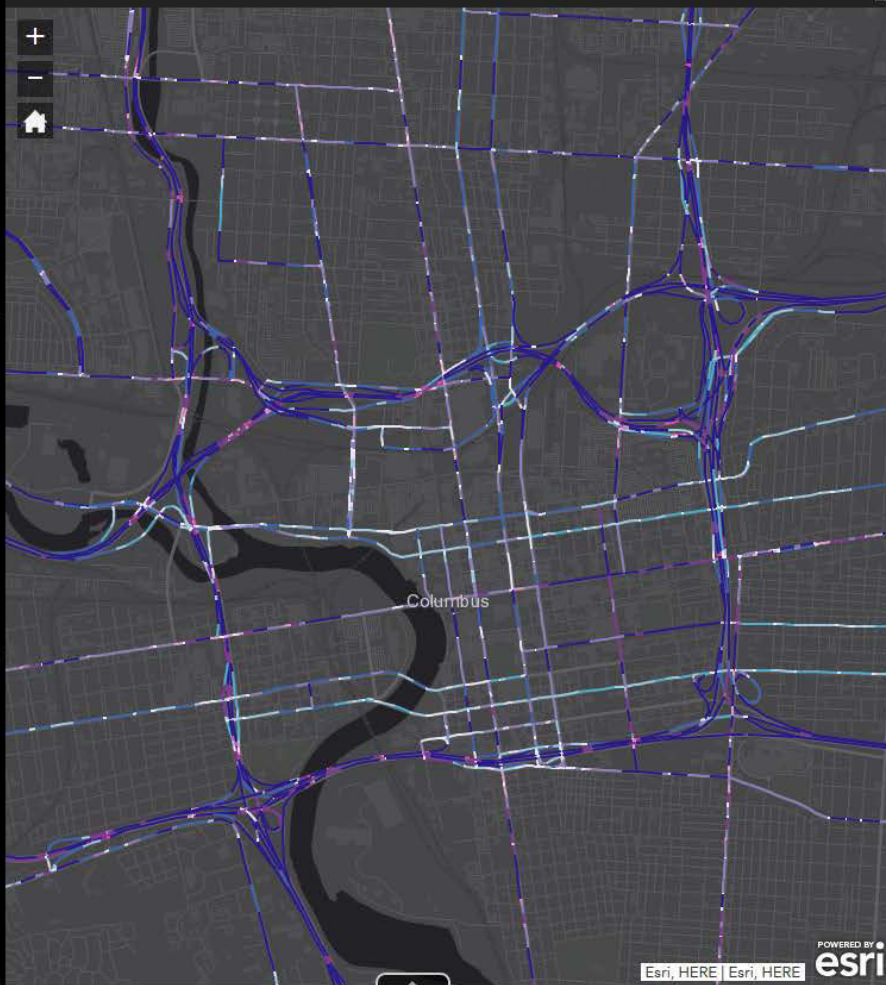


Charts by Defined Area

Click one of the following task items to execute chart.

- Energy by Speed >
- Total Energy by FRC >
- Vehicle Coefficients by Speed >
- Vehicle Coefficients by FRC >

Clear



RATE-C Geoprocessing Tool

TomTom API Key

Date*

10/16/2019 01:55:50

Conventional Gasoline Ratio*

0.7

Conventional Diesel Ratio*

0.2

PHEV Ratio*

0.04

HEV Ratio*

0.05

BEV Ratio*

0.01

Legend

Columbus Road Network

Relationship

- Total Energy
- Average Energy Per Vehicle



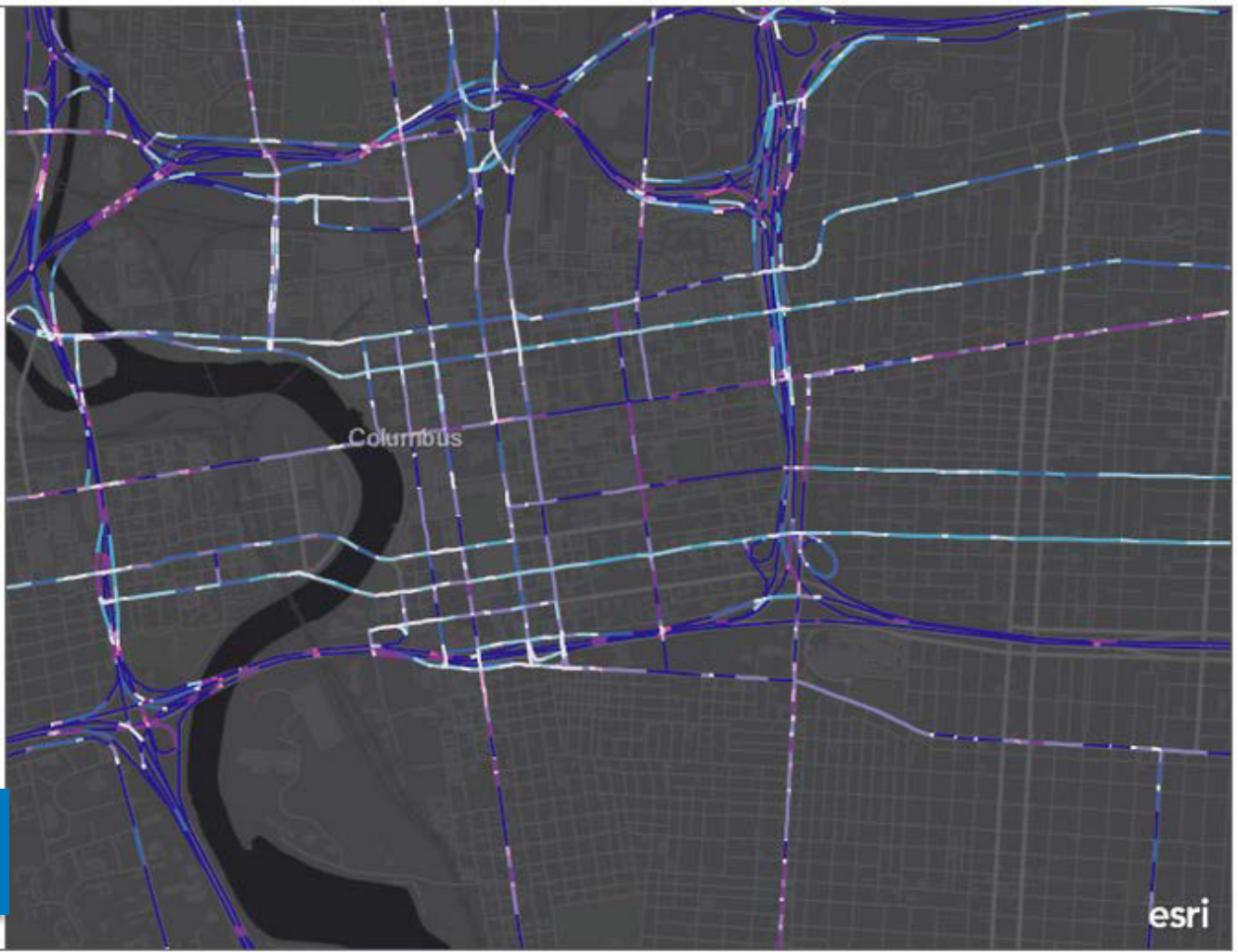
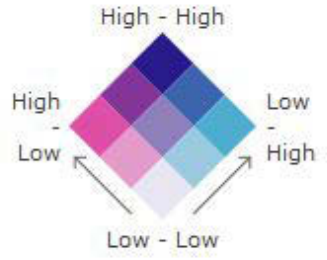
Example Analysis

- Compare the energy impacts on the Columbus, Ohio road network assuming 20% market penetration of Level-5 connected and automated vehicles.

Columbus Road Network (Normal)

Relationship

- ↖ Total Energy
- ↗ Average Energy Per Vehicle

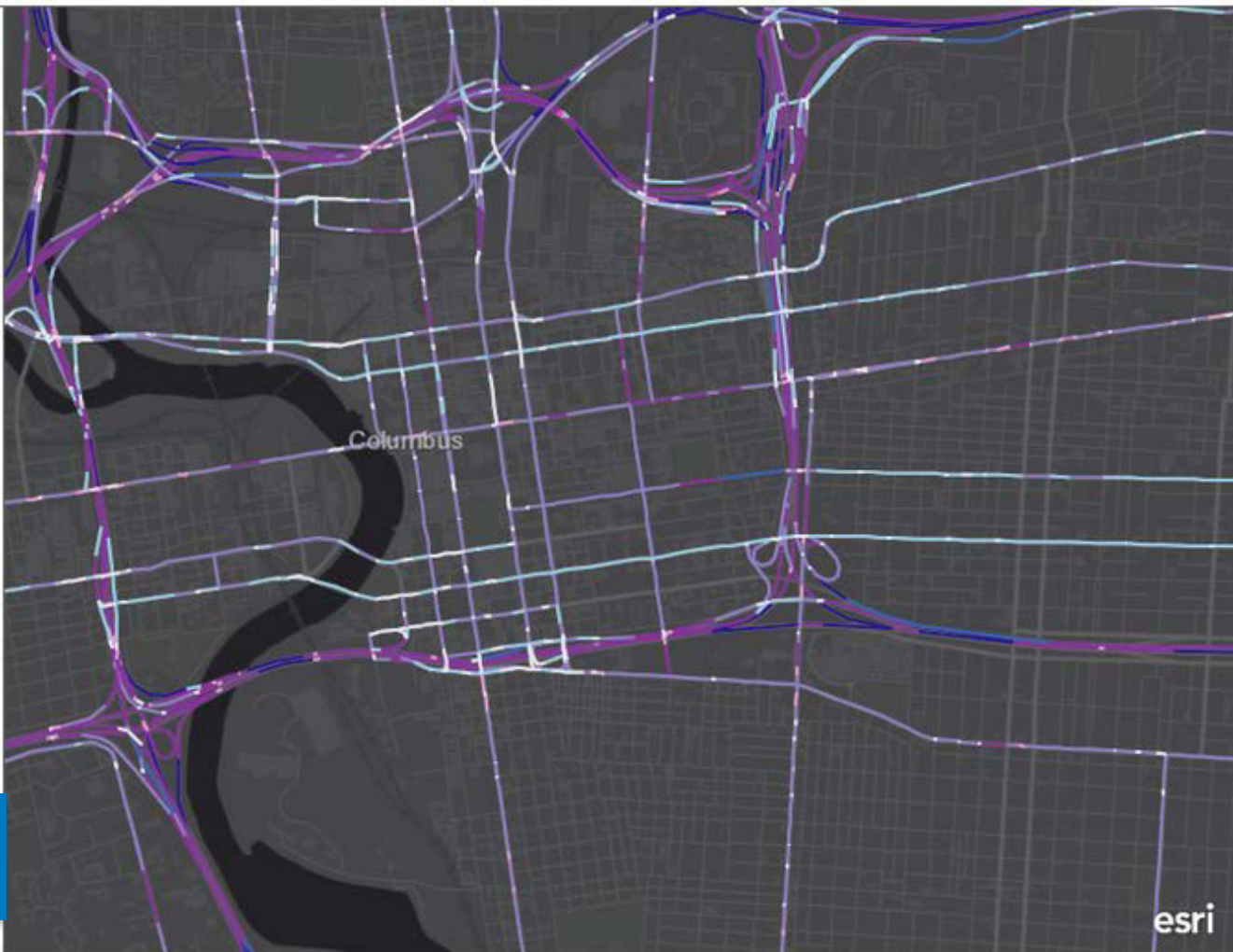
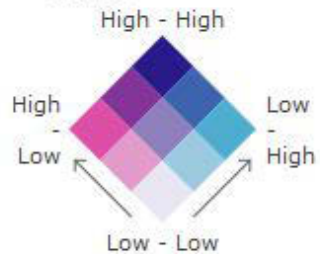


Total energy:
2.60 million GGE

Columbus Road Network (20% L5 CAVs)

Relationship

- ↖ Total Energy
- ↗ Average Energy Per Vehicle



Total energy:
2.56 million GGE

Conclusion

- Visualize information, not data.

Questions?

www.nrel.gov

NREL/PR-5400-75285

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