GIS Visualization of Transportation Energy Consumption

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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.
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

Train & Validate

Train custom models with user-provided data

Mapping & Routing

Predict

Energy use on link(s) and route(s)

"Out of the box" user workflow
RATE-C Overview

Use different RouteE models and vehicle choice models to analyze impacts on network-wide energy changes.

Core API workflow

- Traffic Volume and Speed
- Road Network
- RATE-C function
- Road network with energy metrics by vehicle type
- Custom RouteE models and fleet makeup
• Relationship symbology identifies zones of:
  – Higher efficiency (left, pink)
  – Lower efficiency (right, blue)
  – General high-volume areas (top, violet)
2,602,538 GGE
Example Analysis

• Compare the energy impacts on the Columbus, Ohio road network assuming 20% market penetration of Level-5 connected and automated vehicles.
Total energy: 2.60 million GGE
Total energy: 2.56 million GGE
Conclusion

• Visualize information, not data.
Questions?

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