AERIS: IntelliDrive\textsuperscript{SM} for the Environment
An Overview
Applications for the Environment: Real-Time Information Systems

Marcia Pincus, ITS Joint Program Office

SS5: IntelliDrive\textsuperscript{SM} for Mobility, Weather and Environment
Monday, May 3, 2010
2:00pm-3:30pm
ITS America Annual Meeting, Houston, TX
Setting Some Context

- AERIS is a new direction for the ITS JPO
- In the process of educating ourselves
- Research scope and program is forming
- Depending on the ITS community to help form and inform
- Team is multimodal
  - FHWA (TFHRC, HEP, HOFM)
  - NHTSA
  - FTA
  - FMCSA
  - OST
  - Seeking other modes (MARAD, FRA?)
Why AERIS?

Environmental Problem
- 2.9 billion gallons of wasted fuel each year – 3 weeks worth of gas for every traveler
- Transport approx 28% of US GHG;
- Vehicles 80% of this slice of pie

Environmental Goal
- ↓Emissions ↓Greenhouse Gases
  ↓Particulates:
  □ Enable better environmental management through connectivity
  □ Enable traveler choice for eco-friendly options
What Can ITS Do?

- Many strategies available to reduce transportation’s percentage contribution to GHG
  - Vehicle improvements (zero-carbon or near-zero-carbon vehicles)
  - Fuel improvements
  - Reductions in VMT
  - Operational improvements to the system as a whole
  - Improvements in operating efficiency of individual vehicles

- ITS can contribute – *we think*

- Our job is to figure out how ITS may contribute to GHG reductions and how much, in an IntelliDrive℠-enabled future.
Background

- The **ITS Program Advisory Committee** recommended that ITS JPO pursue environment-related research in its new Strategic Plan.
- Stakeholders also eager to pursue this new area of research.
- AERIS research **scoped with extensive stakeholder input**, including **Departmental leadership**.
- AERIS **Charter** signed mid-March.
- Now in the process of refining the roadmap, articulating exactly what we plan to do, how we plan to do it, when, and with whom:
  - Answer your questions if we can.
  - Take note of whatever input you’d like to offer.
  - See if there are **areas of mutual interest and collaboration**.
Knowledge Gaps for Environmental Data and ITS: Opportunities to Learn

- Need to look at the existing transportation system data, and the cutting edge of communication and data exchange between vehicles and between vehicles and infrastructure (and vice versa), and see if there are a handful of applications or scenarios that provide a significant environmental benefit as a consequence of employing IntelliDrive℠.

- We are just beginning the effort to extensively test V2V and V2I communications and data exchange, and looking at developing applications for safety, mobility, and environment.
  - For the environment, research is underway, but much more needs to be understood, modeled, tested and evaluated, especially in real-world situations at a larger scale.
Knowledge Gaps for Environmental Data and ITS: Opportunities to Learn (cont’d)

- Need to **leverage and expand opportunities** for public, private and academic sector application development and research by developing new data sets and **new opportunities for data** use, focused on using **public infrastructure**.

- Opportunity to take a **multi-modal approach** to research: **all types of vehicles** (cars transit, trucks, etc.) must be examined
  - This is **critical to the success** of AERIS.
AERIS: Research Goal and Objectives

- Ultimate “Stretch” Goal
  - Transform environmental management of the transportation system.

- Objectives
  - To investigate whether it is possible and feasible to generate/capture environmentally-relevant real-time transportation data (from vehicles and the system), and use this data to create actionable information that can then be used by system users and operators to support and facilitate “green” transportation choices for all modes.
  - Assess whether doing these things yields a good enough environmental benefit to justify further investment.
Examples of “Green Choices” for System Users and Operators

- Eco-driving using signal phasing and timing (SPaT)?
- Integrated Corridor Management (ICM)-like system able to optimize for environmental factors?
- Work zones, incident management, special event applications?
- Parking applications?
- Transit and freight applications?
- Pricing/payment applications?
- Others?
- “Next-Generation”?
  - New ways of managing the entire transportation system that can result in transformational change from an environmental perspective
  - Innovative public sector responses that could be developed to respond to private sector advances
AERIS Research Questions

- Three overarching questions:
  - **Data**
    - What vehicle-based data is available, and what is its quality and validity? *(All types of vehicles)*
  - **Information/Connectivity**
    - How can vehicle-based data be used and integrated with existing transportation system operation and other data (such as road weather data, for example)?
  - **Benefit**
    - What cross-modal public-sector oriented applications/strategies are available, or could be available/developed, and what are their expected benefits?
How Do We Envision Success?

Success will be measured by progress on:

- Development and execution of an extensive foundational research program that will inform application and strategy development by both the public and private sectors.
- Identification of the most effective and promising technological solutions that merit future research investment.
- Evaluation of data/technology gaps
- Use of ITS data to improve models
- Providing fertile ground for public and private sector application development
AERIS Guiding Principles

- AERIS will leverage existing and future research, data and technologies to develop, enhance, and eventually demonstrate ITS applications that are proven to reduce the negative impacts of transportation on the environment.
- AERIS will build on applications that will take advantage of V2V and V2I communication links and vehicle data sets to achieve benefits.
- AERIS will utilize real-time data from the Data Capture and Management Program, the Dynamic Mobility Applications Program, the Road Weather Management Program, freight and transit research programs, etc.
- AERIS will feed IntelliDriveSM environmental data into various environmental and other models to improve them if possible, and thereby improve evaluation and performance measurement capabilities.
AERIS Guiding Principles (cont’d)

- AERIS will promote the use of **real-time information** to help travelers and system operators make more informed decisions (alternate route, mode switch, trip delay, vehicle operation) and give them more **eco-friendly transportation options** that reduce the environmental impacts of transportation choices.
- AERIS will be a **multi-modal** research effort; multi-modality is key.
- AERIS will focus on **air quality and GHG** impacts of transportation.
- AERIS will **cultivate a new set of champions**, not only stakeholders
AERIS Research Program: Six Tracks/Five Years

- **Track 1: Establish the Foundation** by comprehensively reviewing the **state-of-the practice** to:
  - Determine the limits of current technology and available data sets.
  - Identify the limits and challenges of monitoring and analysis, including a **review of existing models** and algorithms.
  - Examine where ITS technologies and data can be **most effective** and contribute maximum value to addressing environmental impacts.
  - Use existing models to **initially explore** the effectiveness of improvement strategies.
AERIS Research Program: Six Tracks/Five Years

- **Track 2: Identify initial candidate strategies and applications** that appear to improve environmental decisions by public agencies and travelers.
  - Characterization and screening of applications/strategies
  - **Assessment** of the technology and data gaps
  - Initial cost-benefit analysis and “down-selection.”
Track 3: Analyze and evaluate candidate strategies and applications that make sense for further development and evaluation based on the expectations of their potential contributions.

- Identification and analysis of evaluation tools and baselining of tools for measuring and evaluating applications and scenarios
- Build a robust evaluation process
- Conduct gap analysis with respect to models and data; attempt to fill gaps
- Conduct in-depth evaluation and benefit/cost analysis
Track 4: Recommend strategies and applications

- Based on cost/benefit analysis, but also: risks and opportunities, existence of enabling technologies, acceptance of public/stakeholders, feasibility of deployment, and appropriateness of further DOT support.

- Development of Research Investment Plan in consultation with stakeholder community.
Track 5: Develop the facts and evidence needed to inform any future policy and regulatory issues.

- Ideas include:
  - Exploration of the relationships between traveler behavior and incentives including legislative/regulatory atmosphere both within and outside the Department;
  - Monitor progress in private sector application development, commercialization, and markets;
  - Ongoing analysis of carbon policies and worldwide environmental agreements.

Track 6: Stakeholder Engagement and Tech Transfer

- Who do we engage?
- How do we engage them?
- How often do we engage them?
- How do we do this effectively and creatively?
AERIS Stakeholder Engagement and Leveraging Research: Ideas? Input?

- New stakeholder group for ITS JPO: opportunities and challenges too.
  - Some combination of environment experts and interest groups, IntelliDrive℠ stakeholders, academic researchers, and other parties including private sector
    - Leverage/support existing research and activities – how to best do this?
    - International interest and cooperation is also critical
  - Identification of champions, not just stakeholders – how to do this?
  - Challenge with some stakeholders – how to overcome?
  - Creative strategies for identifying and educating stakeholders and researchers about AERIS?
- How do we best identify and engage stakeholders and leverage research to help accomplish AERIS research objectives?
- IDEAS NEEDED.