AERIS: IntelliDrive℠ for the Environment
An Overview

Applications for the Environment: Real-Time Information Systems

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SS5: IntelliDrive℠ for Mobility, Weather and Environment

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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^{SM}-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^{SM}**.
- 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**.

IntelliDrive℠
Safer. Smarter. Greener.

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 IntelliDrive^{SM} 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."**

AERIS Research Program: Six Tracks/Five Years (cont'd)

- **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

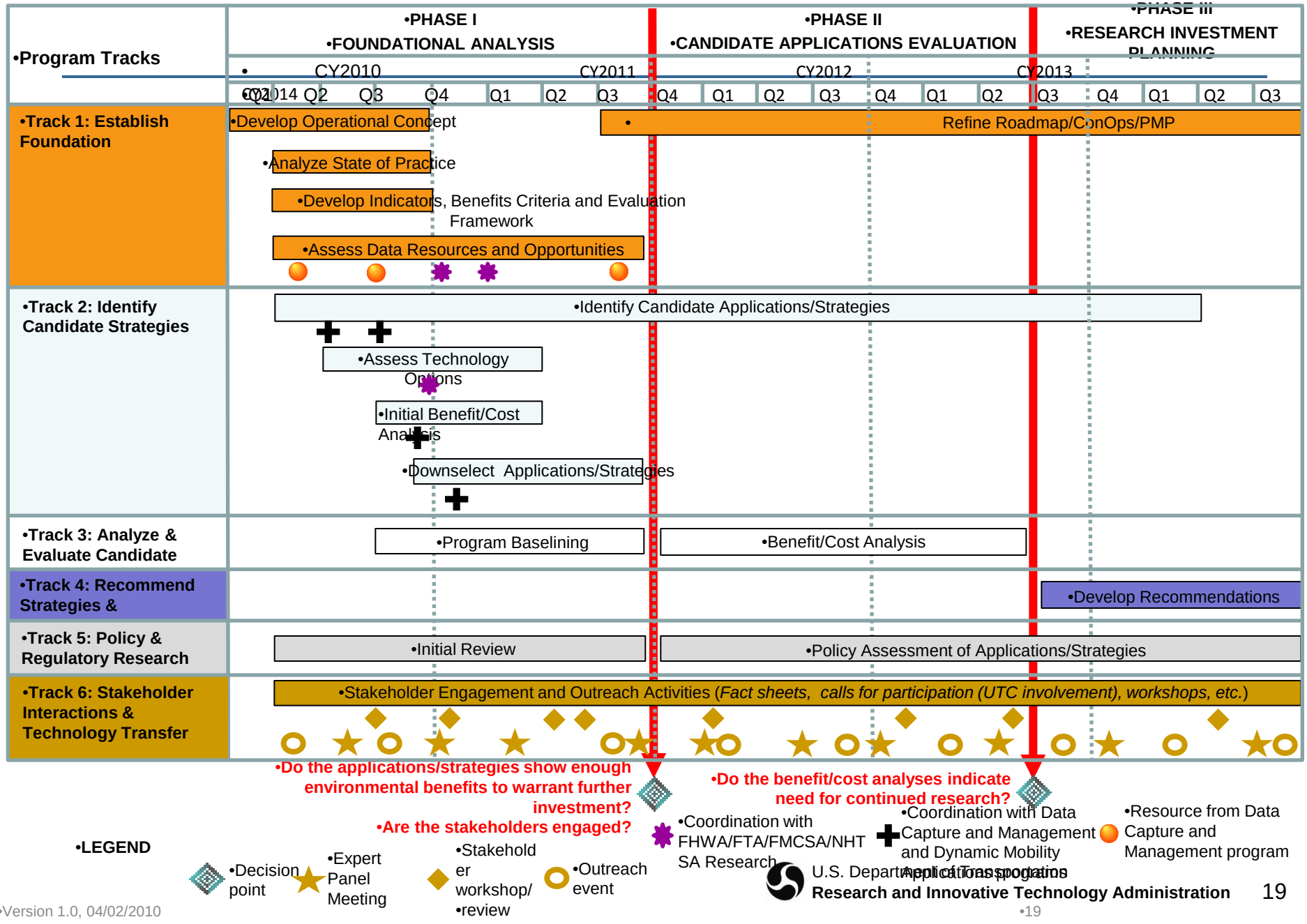
AERIS Research Program: Six Tracks/Five Years (cont'd)

- **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.**

AERIS Research Program: Six Tracks (cont'd)

- **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?

•Applications for the Environment: Real-Time Information Synthesis (AERIS) High-Level Roadmap



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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.**

AERIS

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