Accelerating Sustainability

Demonstrating the Benefits of Transportation Technology

Anthony Shaw

Goals

- **Directly compare** the benefits of various technologies
- **Demonstrate** the potential fuel consumption and emissions savings
- **Illustrate** through real world "use cases"

Technologies

- 16 transportation technologies
- Four technology categories:
    1. **Vehicle Technologies**
    2. **Traveler Information Technologies**
    3. **Infrastructure and System Operations**
    4. **Alternative Fuel Technologies**

Projections

- Two measures:
  - Carbon dioxide (CO_2) emissions
  - Fuel consumption
- Two scales:
  - For a single vehicle
  - On a national scale
- 10 years

Results

- Magnitude of first-order benefits:
  - *Eco-navigation: 100 million barrels of oil, 18 million metric tons of CO_2 in final projection year*
  - *Gas-electric hybrids: over 400 million barrels of oil, 30 million metric tons of CO_2 in final projection year*
- A "tool kit" with which to make the case for intelligent transportation
- A model that can be updated as new data becomes available

Cooperative-Adaptive Cruise Control

- How it works:
  - Based on currently available technology
  - Grouping vehicles into a "platoon"
  - Improves efficiency on the highway
  - Aerodynamics!

Cooperative-Adaptive Cruise Control

- Magnitude of first-order benefits:
  - *1,000 lbs./year of CO2 for a single heavy duty vehicle*
  - *100 lbs./year of CO2 for a single light duty vehicle*
  - *7 million metric tons of CO2/year in final projection year*

Cooperative-Adaptive Cruise Control

- Conclusions:
  - Wireless connectivity triples efficiency
  - Safety/mobility application, environmental benefits
  - Recent regulatory activity from U.S. DOT shows that government supports underlying technology

Real-Time Adaptive Signal Control

- How it works:
  - An enhancement of previous adaptive systems
  - Optimizes signal timing plans
  - Informs downstream intersections
  - Best for unforeseen, unpredictable, or conflicting traffic patterns

Real-Time Adaptive Signal Control

- Magnitude of first-order benefits:
  - *Around 2 million metric tons of CO_2 per year*

- Conclusions:
  - Mobility application, environmental benefits
  - Currently deployed in Pittsburgh, PA

Use Cases

- **Traffic Signal Synchronization** in Los Angeles County, CA
- **Real-time Adaptive Signal Control** in Pittsburgh, PA
- **Advanced Fleet Management** at the Smithsonian Institution
- **Smart Parking** in Ellicott City, MD

Conclusions

- **Tremendous first-order benefits** if applied on a national scale

- **Modular "tool kit"** that can be tailored to audience

- Mobility and safety applications **also benefit the environment**

- **Government support for underlying technologies**