Why do ITS Projects Need Systems Engineering?

- Some products and solutions are technology based
  - Most new technologies are not programmatic
- Ensures that the investment meets the needs
- All federally funded ITS projects require a Systems Engineering analysis
  - Programmatic – Systems Engineering Review Form (SERF)
    - Development and deployment of standard ITS systems
  - Non-Programmatic – Concept of Operations
    - ITS systems not previously used nor in current use by the Agency

Systems Engineering Documents

- Concept of Operations
  - Non-technical description of how the system will be used
  - System needs, goals, and objectives
  - Stakeholder Outreach
- System Requirements
  - What needs to be achieved by the system

Example Statements

- Concept of Operations Needs
  - The system needs to prevent queues forming at user-specified locations
- System Requirements
  - When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode.
  - The ASCT shall detect the presence of queues at pre-configured locations.
  - When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.
- Verification
  - Test Case/Demonstration: Length of queues, detector data,
- Validation
  - Performance Measure: Delay
Traceability

Systems Engineering & Contract Documents

- Benefits of incorporating Systems Engineering requirements into bid documents
  - Traceability
  - Submittal Acceptance
    - Require contractors/vendors demonstrate how they fulfill the system requirements before awarding contract
  - Definition of responsibilities

Procurement Plan

- Sole Source (Highest Cost, Least Risk)
  - Only allowed in certain circumstances
  - Direct selection of a contractor without competition
  - 23 CFR 635.411 provides the regulatory authority for FHWA’s participation in the cost of a patented or proprietary product
- Low Bid (Least Cost, Highest Risk)
  - Based on the lowest price offered
  - “Competitive procurement does not mandate low bid” – FHWA Model SE
  - “rarely satisfactory method of procuring a complex system such as ASCT” – FHWA Model SE
- Proposal Based Selection (Best Value, Negotiated, Price and other factors)
  - Based on the evaluation a technical proposal
  - Weighted combination low-bid and negotiated methods of award
  - Design-Build

NCHRP REPORT 560: Guide to Contracting ITS Projects
NCHRP REPORT 561: Best-Value Procurement Methods for Highway Construction Projects

Important Constraints for ASCT

- System Cost
  - Capital
  - Operations
  - Maintenance
- Procurement
  - Low-Bid
  - Price and Other Factors
- Agency Resources
  - Operational objectives
  - Staff skills
- Site Suitability
  - Arterial vs grid
  - Congestion
  - Objectives
- Existing Infrastructure
  - Closed Loop
  - Centrally Managed
  - Communications
  - Detection