**EDC EXCHANGE – August 16, 2012**

**Adaptive Signal Control Technology (ASCT)**

**Exchange Questions & Answers**

## Operations & Maintenance

**Question:** What did the timing maintenance program consist of?

**Answer:** Eric Graves: Our timing maintenance program consists of systemic retiming of each corridor every 2 to 3 years.

**Question:** How does ASCT change left turn lead/lag phases?

**Answer:** Several ASCT systems are capable of modifying phase sequence (lead/lag phases). The need to modify phase sequence is addressed in the FHWA Model Systems Engineering Document <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm>.

**Question:** Is there a recommendation for number of signals per engineer responsible for monitoring/maintaining?

**Answer:** The staffing required for O & M should be based on the agencies operations, maintenance and performance objectives. Publications related to traffic signal management and operations can be found on the FHWA Arterial Management Website <http://ops.fhwa.dot.gov/arterial_mgmt/traffic_sig.htm>.

**Question:** Do you have any case studies of how the multijurisdictional coordination has worked with ACS systems?

**Answer:** We are not aware of any documented case studies of multijurisdictional adaptive systems. Several multijurisdictional systems are under construction including SR-9 in the Atlanta Metropolitan area and NJ Meadowlands Commission.

**Question:** What is the typical lag between data collection/processing and the change to the timing plan? How have agencies overcome this lag?

**Answer:** The responsiveness of an adaptive system is specific to its functional objective and availability of parameters that dictate how the system responds to small and large shifts in demand. The desired level of responsiveness should be described as a system requirement, guidance on system responsiveness is included in the Model Systems Engineering Documents for ASCT FHWA–HOP-11-027 <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm>.

**Question:** How does an adaptive system work? Where are the detectors located?

**Answer:** There are over 16 Adaptive systems available in the U.S., each system is designed to respond to a specific set of operational objectives and has specific detection requirements.

**Question:** How do the ASC Systems address new development?

**Answer:** the Model Systems Engineering Documents for ASCT, FHWA–HOP-11-027 <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm> provides guidance on signal grouping. The agency must examine its needs to determine if Intersections that are part of a new development should be accommodated within the signal grouping for an ASCT or if those intersections should constrain the operation of the ASCT.

**Question:** When does ASCT does not make sense to use?

**Answer:** the Model Systems Engineering Documents for ASCT, FHWA–HOP-11-027 <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm> discusses alternative operational strategies. Implementation of ASCT should be considered after other existing operations strategies have been evaluated and do not adequately address agency needs and objectives.

**Question:** Does anyone have experience using red light camera enforcement within an adaptive signal system? If so, is there a concern that the onset of red being variable and challenging to driver expectations?

**Answer:** I am not aware of an ASCT system installed on an arterial also equipped with red light cameras.

**Question:** What are the limitations of the technology in terms of traffic volume and number of intersections in the system?

**Answer:** Each specific ASCT pursues specific operational objectives; the agency should define its needs through a systems engineering analysis. Adaptive systems operate under a variety of traffic demands and each system may have unique limitations on number of intersections.

**Question:** What is the difference between ASC and a regular closed loop system?

**Answer:** Adaptive systems are capable of data collection/monitoring and optimization based on a set of specific functional objectives. Closed loop systems typically do not have the ability to automatically adjust signal timing parameters in response to ongoing performance evaluation.

## Benefits

**Question:** Would most ACS systems be able to document traffic data to show the improvement or where you might need improvement areas?

**Answer:** Most ACS systems record traffic and performance data. Performance monitoring is addressed in the FHWA Model Systems Engineering Document <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm>

**Question:** What measurement tools are they using to determine performance improvements?

**Answer:** Each adaptive system operates according to a specific set of functional objectives and typically reports performance in the context of those objectives i.e. phase utilization. Typically floating car studies are conducted to evaluate improvements in travel time and delay.

**Question:** If you have an existing system, how do you justify the cost of an ACS System?

**Answer:** Adoption an objectives and performance based approach to transportation planning is encouraged to enable agencies to define specific operations needs and performance objectives. By following this approach, management and operations strategies such as adaptive control can be evaluated to determine how they might facilitate the achievement of operations objectives allowing them to compete more effectively for transportation funding. More information on this approach is available on the FHWA Planning for Operations website <http://www.plan4operations.dot.gov/>.

**Question:** Which jurisdictions have used emissions and noise measurements to evaluate the system improvements due to ASCT implementation?

**Answer:** Visit the Research and Innovative Technology Administration (RITA) Knowledge Resource database to view system evaluations. <http://www.itsknowledgeresources.its.dot.gov/its/benecost.nsf/BenefitsHome>

**Question:** Would someone be able to share any experiences with the legal implications associated with ASCT? For example, we currently have documentation with signal cards. What is available as documentation with ASCT systems when there is a crash and a request for timing?

**Answer:** Most adaptive systems collect a high resolution of signal timing data that can be used to reconstruct the signal timing during a specified time period. The FHWA Model Systems Engineering Document <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm> discusses performance monitoring and data collection needs and requirements that agencies can tailor to address specific needs.

**Question:** Do these systems come with a simulation program, to estimate the saving?

**Answer:** Some systems do have specific resources that facilitate simulation/animation; if this resource is desired it should be required as part of the system implementation.

## Systems Engineering

**Question:** What are the National efforts to develop standards for this technology?

**Answer:** The FHWA Model Systems Engineering Document <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm> describes standards that can be referenced for adaptive signal control technology implementation.

**Question:** Is systems engineering done on a Statewide, Regional, and/or individual corridor level?

**Answer:** A systems engineering can be conducted on a level commensurate with the needs of the agency.

**Question:**  Is system engineering only a requirement when using federal dollars?

**Answer:** Systems engineering is required for federally funded ITS projects per Rule 23CFR940.11. Systems engineering is not required for locally funded projects however the process does significantly address many of the risks associated with ASCT implementation.

**Question:** With the Systems Engineering Document, does it help identify a good candidate for the ASCT or does it only provide functional requirements after it has been determined a good candidate?

**Answer:** Completion of a systems engineering document will produce a set of system requirements that facilitate an alternatives analysis that inform the agency of the best candidate systems.

**Question:** Does the system engineering process only help determine the type of system or can it help determine if adaptive is a good system to use?

**Answer:** The systems engineering process will produce a set of requirements that respond to the agencies operation’s needs. The FHWA Model Systems Engineering Document <http://ops.fhwa.dot.gov/publications/fhwahop11027/index.htm> also facilitates the exploration of alternative non-adaptive strategies.

## Funding & Costs

**Question:** Since one of the benefits is reduced fuel consumption, would CMAQ funding be available to implement a system?

**Answer:** Yes, ASCT is eligible for CMAQ

**Question:** One of our participants is under the understanding that ACS Lite is available through FHWA at no cost to local agencies. Is this true?

**Answer:** FHWA does not provide the ACSLite in any capacity. ACSLite can be purchased from Siemens, Econolite, McCain or Peek.

**Question:** What is the cost of deploying an adaptive system?

**Answer:** The approximate cost of deploying an adaptive system ranges between $3,500 and $50,000 and is heavily dependent on existing traffic signal control, detection and communication infrastructure.

**Question:** What are the licensing and cost of the various systems?

**Answer:** The approximate cost of deploying an adaptive system ranges between $3,500 and $50,000; respective vendors should be contacted directly to determine the licensing and cost of specific information.

**Question**: What is theO&M cost after the system is implemented? Any case studies or information on how to address this?

**Answer:** NCHRP Synthesis 403 provides a qualitative perspective on operations and maintenance needs for adaptive control systems. We are not currently aware of quantitative data related to operations and maintenance of adaptive systems.

## Alpharetta ASCT System – Presenter Eric Graves

**Question:** What type of detection is being used in Alpharetta and what maintenance challenges exist?

**Answer:** We use standard loops for signal timing and have used the Sensys wireless devices for our system detection.  The biggest issue is knowing in advance when a detector is not functioning correctly.

**Question:** What was the cost of the Alpharetta systems - 33 signal over 18 miles.

**Answer:** The full project is nearly $3.4 million with the primary adaptive components approaching $1.34 million.  Keep in mind that this covers two adaptive central systems and that detection was a per intersection cost, rather than specifically designed.  I am expecting future additions to the system to average less than $15,000 per intersection.

**Question:** What were the determining factors that lead you to choose SCOOT over INSYNC?

**Answer:** In our test project, InSync did not accommodate over-saturated operations very well.  We felt it important to have a fall back operations mode that coordinated with our non-adaptive corridors.  SCOOT/TACTICS better integrated that step down in operations mode.

**Question:** How did you go from the SE document to procurement of the system? After the SE process could you then sole source for SCOOT? How do you marry a construction project with a vendor/software requirement?

**Answer:** We did sole source SCOOT as the adaptive control system.

**Question:** Could you talk about the collaborative efforts between jurisdictions in Alpharetta for SR9?

**Answer:** For the SR 9 project, the three cities entered into an IGA to cover the initial project concept phase.  The IGA was continued with a design and construction phase.  The project management team jointly selected the constant team, developed the arterial management concept with the consultants through a systems engineering process, awarded the design contract and approved the bid documents.  Even with all the different City Council activities the process went fairly smooth.

**Question:** Has the SCOOT system improved their user interface to more of a windows type environment?

**Answer:** During our test project, the interface was still that of an UNIX system.  It does operate on a Windows Server, however.

**Question:** How do Alpharetta and Bernalillo maintain their detectors?

**Answer:** We have a Preventative Maintenance program that evaluates all signals twice a year.  Typically, we utilize the state contract to purchase loop repair services.  We also have in-house capabilities when timing or urgency dictates.

**Question:** Can you explain how you paid for the system again?  You purchased, tested, and then were reimbursed?  Is this correct?

**Answer:** The project currently being constructed we will directly pay the contractor and then be reimbursed by GDOT.  For our demonstration projects, we partnered with the vendors providing some of our own equipment and labor.  Much of the vendor equipment was returned after the demo period.

## Bernalillo County – Richard Mobarak

**Question:** Are you going to change your pedestrian actuation within the adaptive signal control system?

**Answer**: If needed, currently the corridor rests in walk during the coordinated phases.

**Question:**  For Bernalillo County, who made the decision on the product after the performance spec was measured?

**Answer:** When the project evaluation occurs, the measurements and calculations for travel time reduction and change in side street delay will be performed by our metropolitan planning organization, the Mid-Region Council of Governments. The decision will be made independently by Bernalillo County engineering staff.

**Question:** How do Alpharetta and Bernalillo maintain their detectors?

**Answer:** They are inspected monthly, but not necessarily tested unless there is an obvious failure then they’ll be replaced.

**Question:** Will staff be added to help maintain the adaptive system in AMPA?

**Answer:** No, at least not initially.

## City of Anaheim – John Thai

**Question:** In Mr. John Thai's presentation on the Estimating Fuel consumption chart what model was used to generate that chart?

**Answer:** Tru-Traffic software was used to import GPS data from the data-loggers and create the estimated fuel consumption charts. Tru-Traffic uses the Comprehensive Modal Emission Model (CMEM). Click on this link <http://www.cert.ucr.edu/cmem/> for more CMEM information.

**Question:** Will ACSLite have the ability to change cycle lengths anytime soon?

**Answer:** The inclusion of cycle length optimization for ACSLite is a development decision that must be made by the vendors.

**Question:** Was systems engineering part of the Anaheim adaptive project?

**Answer:** The FHWA Model Systems Engineering Document was not available when the City of Anaheim procured its adaptive system. Engineering staff conducted a similar analysis to facilitate the development of procurement criteria and validation requirements.

**Question:** For Anaheim - did you look at InSync as well? This is Waterford, Michigan.

**Answer:** Yes and ACS Lite was a better fit for us.

**Question:** Is Anaheim still using SCOOT?

**Answer:** No, Anaheim hasn't used SCOOT for quite a while. Unfortunately, lots of TRB/NCHRP studies and researches were not updated.