

Signal Systems Committee Triennial Strategic Plan

1.0 SELF-ASSESSMENT

1.1 Health & Relevancy of the Committee/Weaknesses

The Traffic Signal Systems Committee Strategic Plan was developed in the early 1990's. Based on the Strategic Plan, the Committee adopted an Action Plan which has been updated periodically, and at last count contained 14 activities. An assessment of the Committee's achievements relating to these activities was completed at the 2003 Summer Meeting. In general, the consensus was that we have done fairly well accomplishing many of our objectives. The summer meeting workshops and the workshops at the Annual meeting have been a strength of the Committee during the last five years including providing the materials on the Committee web site.

The Committee enjoys active participation at the Annual meeting and during our Summer Meeting. Our July meeting in Portland included over 100 participants and over 80% of the Committee membership. This further indicates the interest in and relevance of the Committee. Section 1.2 of this document highlights the Committee membership's involvement with other Committees, which is due in part to the interest other Committees have in working with us. One of the weaknesses has been taking on tasks for which the committee does not have sufficient resources to accomplish.

1.2 Connection to Other Committees

Our connection to other Committees provides both breadth and depth to the membership. The close integration with others (Freeway Systems, Traffic Flow Theory, Highway Capacity and Quality of Service, etc) has allowed members to raise the awareness of signal systems issues beyond our Committee membership. A summary of our Members and Friends and their participation in other committees is attached in an appendix.

1.3 Goals of the Committee

The Committee has two stated goals.

- A. To provide a forum and clearinghouse for the research, development, verification and dissemination of best practices and fundamental principles regarding the planning, implementation, management, and operation of traffic signal and integrated transportation management systems.**

It is our feeling that to positively affect change in the industry, we have to take a step back and help define best practices. Using this documentation, we will disseminate this knowledge through creation of research and synthesis documents in addition to the development of a number of best practice documents, such as the Freeway Operations Manual, Telecommunications Manual, and related traffic signal systems manuals.

It is also our perspective, that while the level of technology currently deployed is vast, key issues keep the industry from achieving its full potential. These issues range from basic

awareness of a system perspective to basic issues such as human capital. The Signal System Committee brings together essential stakeholders who through the TRB label have the ability to define the state of the practice. We would welcome the opportunity for greater coordination between our Committee, ITE and the FHWA.

B. To promote traffic signal systems within integrated urban and regional systems that improve mobility, accessibility and livability, provide safety, and maximize the quality of the environment

The Committee agrees that this goal remains relevant and will remain in the Strategic Plan unchanged.

2.0 ELEMENTS OF THE TSP

2.1 Committee Activities

Our activities in the past three years have centered on four areas: Transit Signal Priority, Adaptive Signal Control, Best Practices of Signal Timing (Detection Device Types, Location, and Their Use), and Communications.

- 2002 Workshop on Transit Signal Priority – Sunday at TRB
- 2002 Summer Meeting – Detection Devices
- 2003 Workshop on Communications for Signal Systems
- 2003 Summer Meeting - Best Practices of Signal Timing (Detection Device Location, and Their Use)
- 2004 Workshop on Adaptive Signal Control & Transit Signal Priority (half-day)
- 2004 Summer Meeting – Best Practices of Signal Timing (Coordination)

In addition to activities as a part of our meetings we have submitted several research problem statements (RPS) that have been successful to varying levels. Currently, NCHRP 3-66 is dedicated to Transition Control Logic from Preemption (a year 2000 Workshop topic that will include a follow-up workshop in 2005). Just recently, the NCHRP program issued a Request for Proposals (RFP) for Evaluation of Arterial Traffic using real-time data (NCHRP 3-79), which will require significant input from our Committee.

Members of the Committee have been active in a variety of activities loosely related to TRB and NCHRP. Currently, FHWA is funding research related to the development of an Adaptive Signal Control (ACS Lite) system that blends previous efforts into existing hardware. We also provided comment on the Traffic Control Systems Handbook, and the Telecommunications Manual although this was completed on an individual basis.

2.2 Critical and Cross-Cutting Issues

The Traffic Signal Systems Committee has addressed critical and cross-cutting issues as part of its regular duties. It continues to identify emerging issues and ways in which they can be addressed.

2.2.1 Capacity/congestion of the transportation system: Current signal systems have limitations that may reduce the capacity of the transportation networks they serve when operating near peak capacity, thus contributing to congestion.

Current state-of-the art in coordinated corridor signal systems works on the basic principal of passing platoons of vehicles along the entire corridor, ideally without stopping them for a red light. This minimizes stops and arterial delay during most conditions. However, when heavy traffic (congestion) occurs at one or more signals in the corridor, but not necessarily along the whole corridor, the control system lacks the ability to pass information “upstream.” For example, if a queue is blocking a link leading to a signal, this information is not captured by the signal system and passed upstream, i.e., the control of the signal system does not change.

This issue has been identified and being partially addressed in NCHRP 3-66 study that is currently under study. Also, “Adaptive Control Systems” (ACS) can address this issue to some degree. The committee has sponsored workshops at TRB meetings that focus on ACS and the members and friends of the committee continue to work in this field to improve these systems to deal with this issue.

More remains to be done and the Committee plans on incrementally focusing on this issue and others that reduce the capacity of networks that rely on traffic signal systems.

2.2.2 Integrating modes and institutions for a more seamless transportation system: Current signal systems have communications limitations between intersections, between agencies, and between modes.

Communications limitations between intersections were discussed under the previous issue. Communications limitations between agencies typically stem from institutional control issues as well as technical issues. While the committee often highlights these control issues, its focus is primarily with the technical rather than the institutional aspects. The committee members and friends continue to identify and address methods and vehicles to enhance the use of common standards in traffic signal system communication protocols. These standards support the goal of improving the ability of signal systems from different agencies communicating with each other.

One area that is making considerable progress in improving the communication between modes is Transit Signal Priority or Signal Control Priority (SCP). The concept behind SCP is that a transit system be given “priority” at traffic signals in order to minimize both the passenger travel time and its variability—two critical variables that affect ridership. Frequently the transit service and traffic signals are controlled by different political structures that require the political will to cooperate for an effective implementation. The committee has conducted workshops on transit priority at TRB and continues to do so. Several of its members and friends actively work on promoting, designing, installing, and operating transit priority systems. Likewise, they work on developing and extending communications standards to better integrate the vehicular traffic control systems with the transit priority control systems.

2.2.3 The growing shortage of transportation personnel: The committee has long recognized the shortage of people to plan, design, manufacture, operate, and maintain traffic signal systems. The problem is exacerbated by the rise in congestion on our systems, which motivates agencies to seek and deploy more technologically advanced systems. These advanced systems often surpass the abilities of current signal system technicians to maintain them without considerable upgrading in their skills. The advanced technician skills needed are also needed by many other industries because

they revolve around computer control devices and their communication protocols. These skills are in high demand and salaries are often much higher than the current signal system agency scales.

While the committee does little to directly address the shortage of technicians, it does address the shortages of people to plan, design, manufacture and operate traffic signal systems. The committee has and continues to sponsor workshops, both at TRB and in conjunction with its summer meeting at various locations around the United States and Canada. The audiences at these workshops are mainly people who design, plan, and operate traffic signal systems and are seeking knowledge about more technologically advanced systems than their current ones. The committee expects to continue to be one of the primary groups that upgrade the knowledge of transportation planners and engineers about the ever evolving technology advances in traffic control systems and how to better plan, design, and operate them. This work will be done through committee sponsored workshops and the work of committee members and friends in other forums and organizations.

- 2.2.4 Making transportation investment decisions: As discussed in the previous issue, a primary focus of the committee sponsored workshop is to provide technical and management knowledge to practicing professionals who plan, design, and operate traffic control systems. A central issue in these workshops is providing guidance and the experience of others in making investments in more advanced traffic control systems. Workshops have been given on Transit Signal Priority, Advanced Traffic Systems, and Telecommunications at TRB. It is anticipated that this workshop vehicle will continue to be used to transfer experience and technology about investment decisions on an ever-changing series of topics. At the summer meetings, Committee members are exposed to the local conditions that may provide insight to practice and lessons learned.
- 2.2.5 Safety: A topic under review on the national scene and within our committee is clearance intervals (all red). Debate exists as to the relationship between the length of the clearance interval and the safety of right-angle collisions. Our committee expects to examine this issue and to promote research that will provide guidance to practitioners on the design of safer clearance intervals in their timing plans.
- 2.2.6 Renewing our aging transportation infrastructure: Traffic signal systems are expensive to purchase, install, and maintain. As technology changes, it becomes difficult to upgrade them in a piecemeal fashion. This tends to delay the installation of more advanced systems and the tools they provide to mitigate congestion and increase capacity. The committee directly addresses this problem through its workshops that each planning, design, and operations traffic professionals about the benefits of newer systems. The workshops also provide networking opportunities for these professionals, allowing them to find people with similar problems as well as people who have overcome these same problems and installed newer systems. The committee expects to continue these activities.

Visioning the Future. Transportation systems in many cases still operate under concepts developed 30 years ago. These concepts have served us well over the years but we must recognize that their development was greatly constrained by available technology. Recent

advances in technology are opening many new avenues for potential systems improvement. The committee is committed to help explore and define these avenues.

2.3 Research Problem Statements

An important part of the Committee meetings are discussions related to Research Problem Statements (RPS). A summary of submitted statements is provided in the Appendix to this document.

As a part of the National Cooperative Research Program, two projects have been selected and approved for funding by SCOR. The first project is ongoing as NCHRP 3-66: "Traffic Signal State Transition Logic Using Enhanced Sensor Information". The second is in RFP stage and is entitled: NCHRP 3-79: "Measuring and Predicting the Performance of Automobile Traffic on Urban Streets".

The Committee is excited about having the opportunity to participate in these exciting projects that make an impact on the state of the practice throughout the profession.

2.4 Millenium Paper

As a part of this Strategic Plan, the Committee Chair and FHWA liaison Paul Olson provided an update to the Millenium Paper. This update is provided in the appendix.