



U.S. Department  
of Transportation  
Federal Highway  
Administration

ITS Tennessee 2011 Annual Meeting  
September 29, 2011  
Memphis, TN



# ADAPTIVE SIGNAL CONTROL TECHNOLOGY



# *Agenda*

- *Every Day Counts Adaptive Signal Control Technology Initiative*
- *Signal timing problem addressed by ASCT*
- *Deployment Status*
- *EDC Goals*
- *FHWA Model Systems Engineering Docs*



# Better, Faster, Smarter



## Shortening Project Delivery

- Planning & Environmental Linkages
- Legal Sufficiency Enhancements
- Expanding Use of Programmatic Agreements
- Use of In-Lieu Fee and Mitigation Banking
- Clarifying the Scope of Preliminary Design
- Flexibilities in ROW
- Flexibilities in Utility Accommodation and Relocation
- Enhanced Technical Assistance on Ongoing EISs

## Technology Innovation

- Warm Mix Asphalt
- Precast Bridge Elements
- Geosynthetic Reinforced Soil
- Safety Edge
- **Adaptive Signal Control Technology**



# What Do Motorists Want?

- *“Why do I have to wait when there’s nobody else moving”*
  - Translation: Equitable distribution of green time
- *“Can’t I just drive down the street?”*
  - Translation: Progression—driving through successive greens



# ***What is ASCT?***

## Addaptive Signal Control Technology







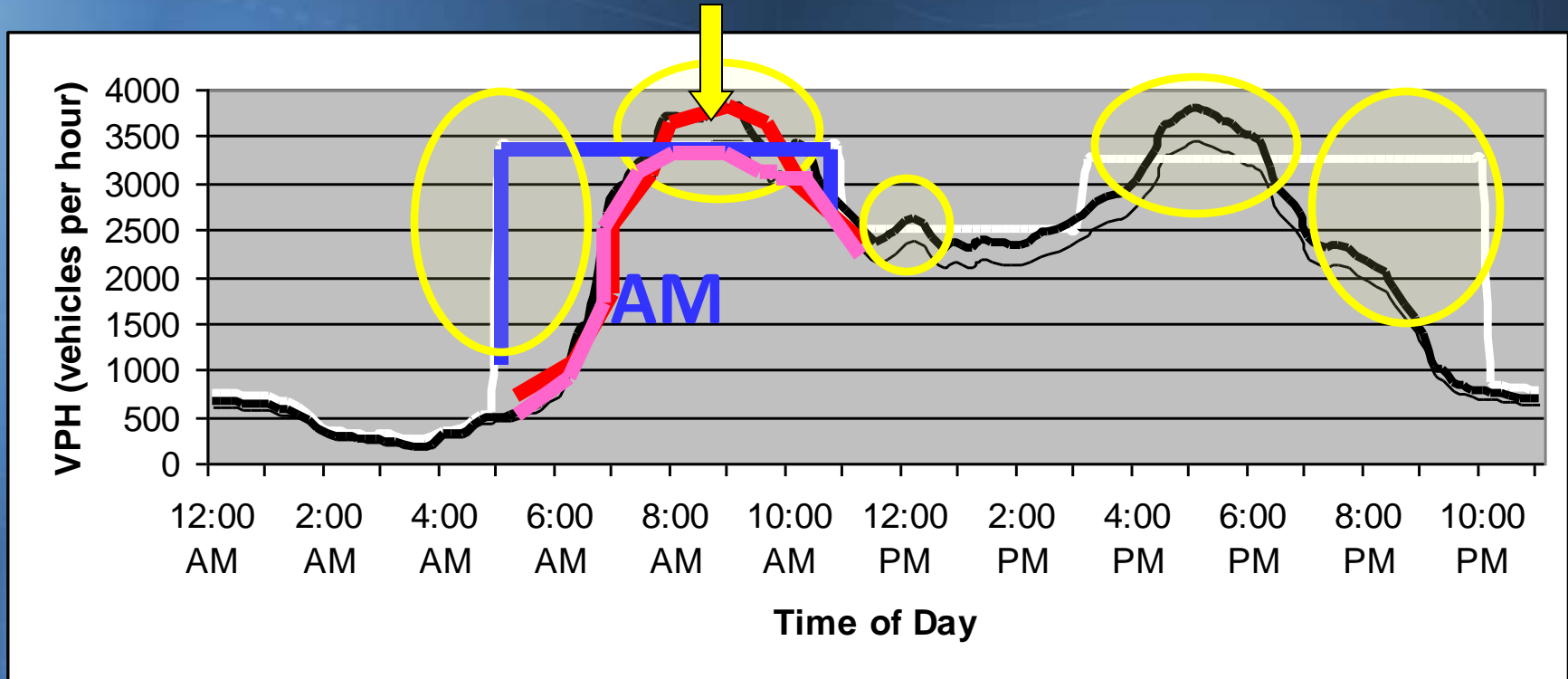
# The Big Box Scenario – Year 1





# TYPICAL Traffic Signal Timing

PEAK 15 Min





# Year 9





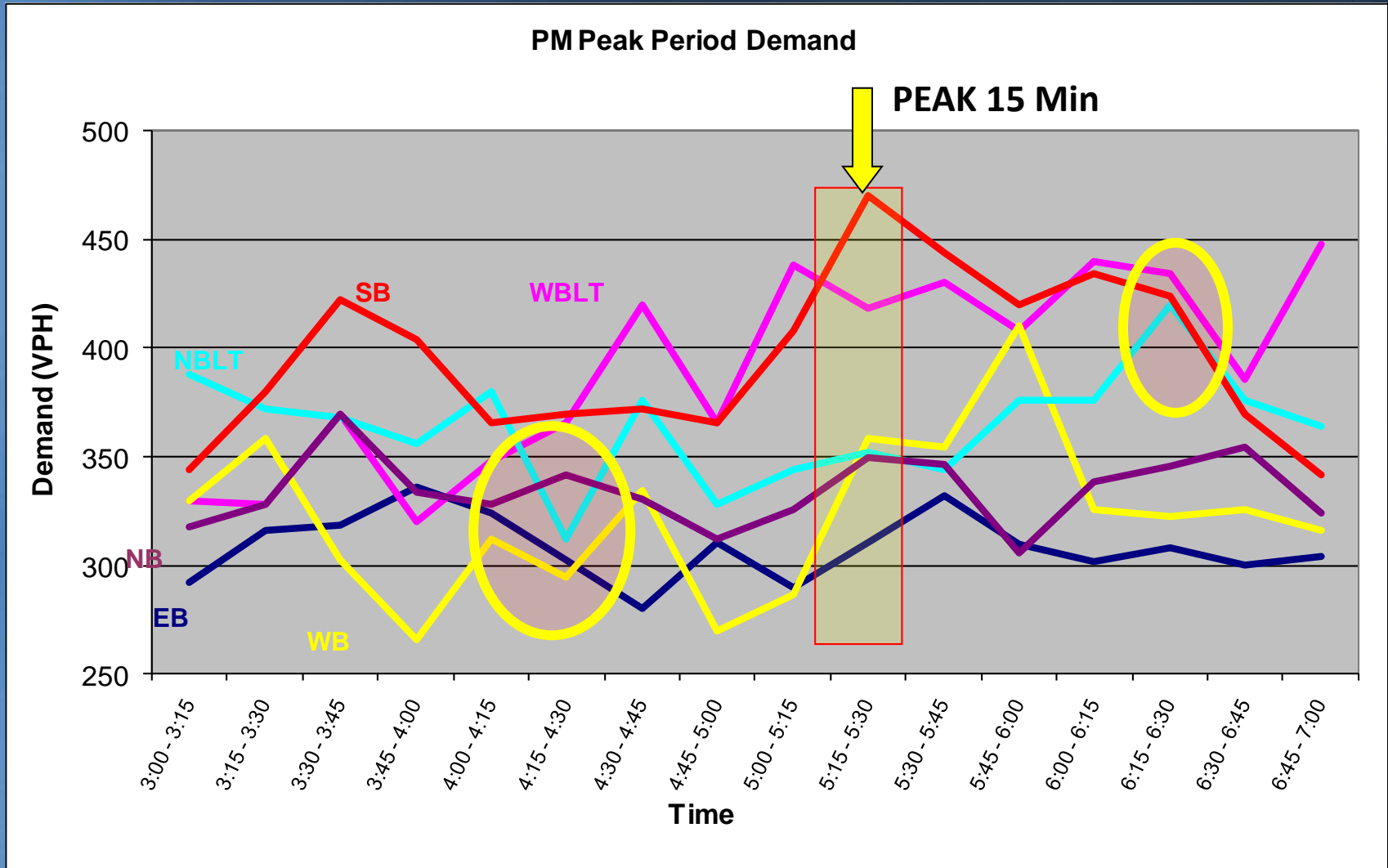


# Year 10





# Variability is Normal—And the Problem







# Year 13





# Delay & Variability

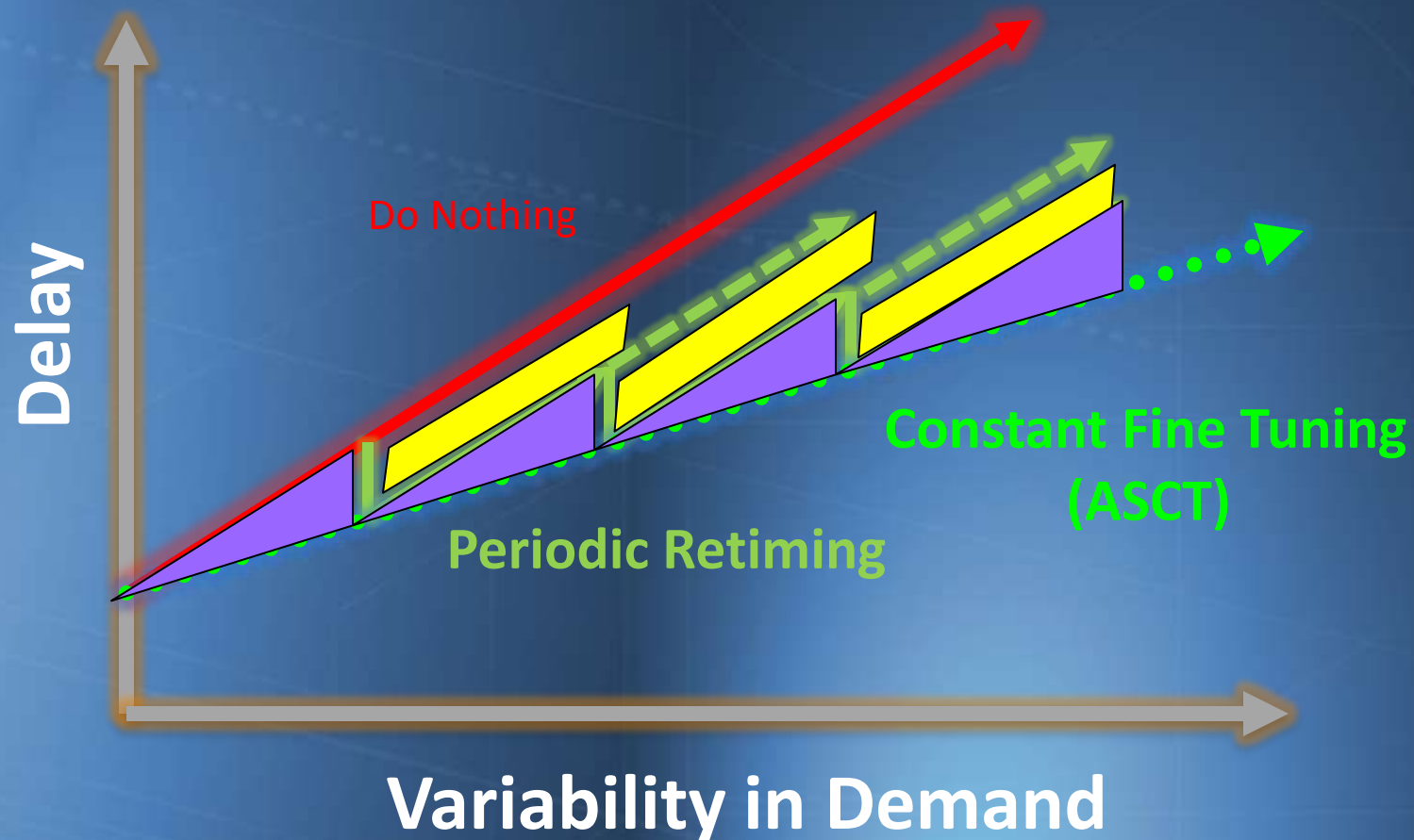
$$d = d1(PF) + \textcolor{red}{d2} + \textcolor{red}{d3}$$







# Benefits of Addressing Variability





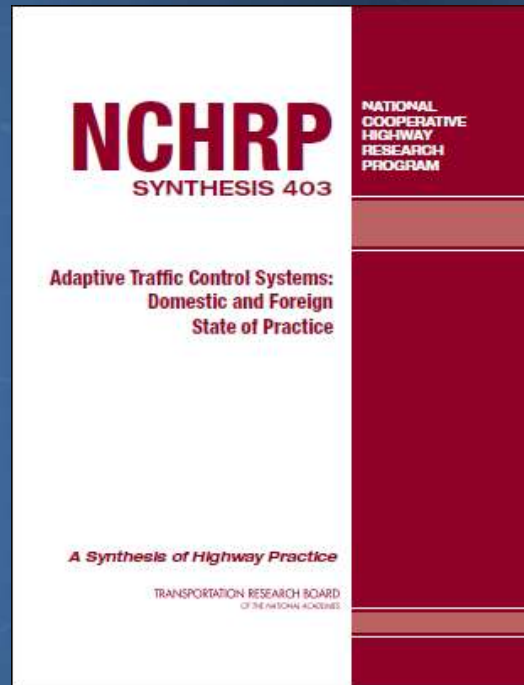
# Adaptive Signal Control Technology

- Better
  - Benefits to Road Users & Agencies
  - Ongoing performance measurement
- Smarter
  - Solves problems that are difficult to address with time-of-day and traffic responsive
  - Saves cost of mundane data collection and retiming
- Faster
  - Reduces retiming intervals from years to minutes



# Readily Available ASCT

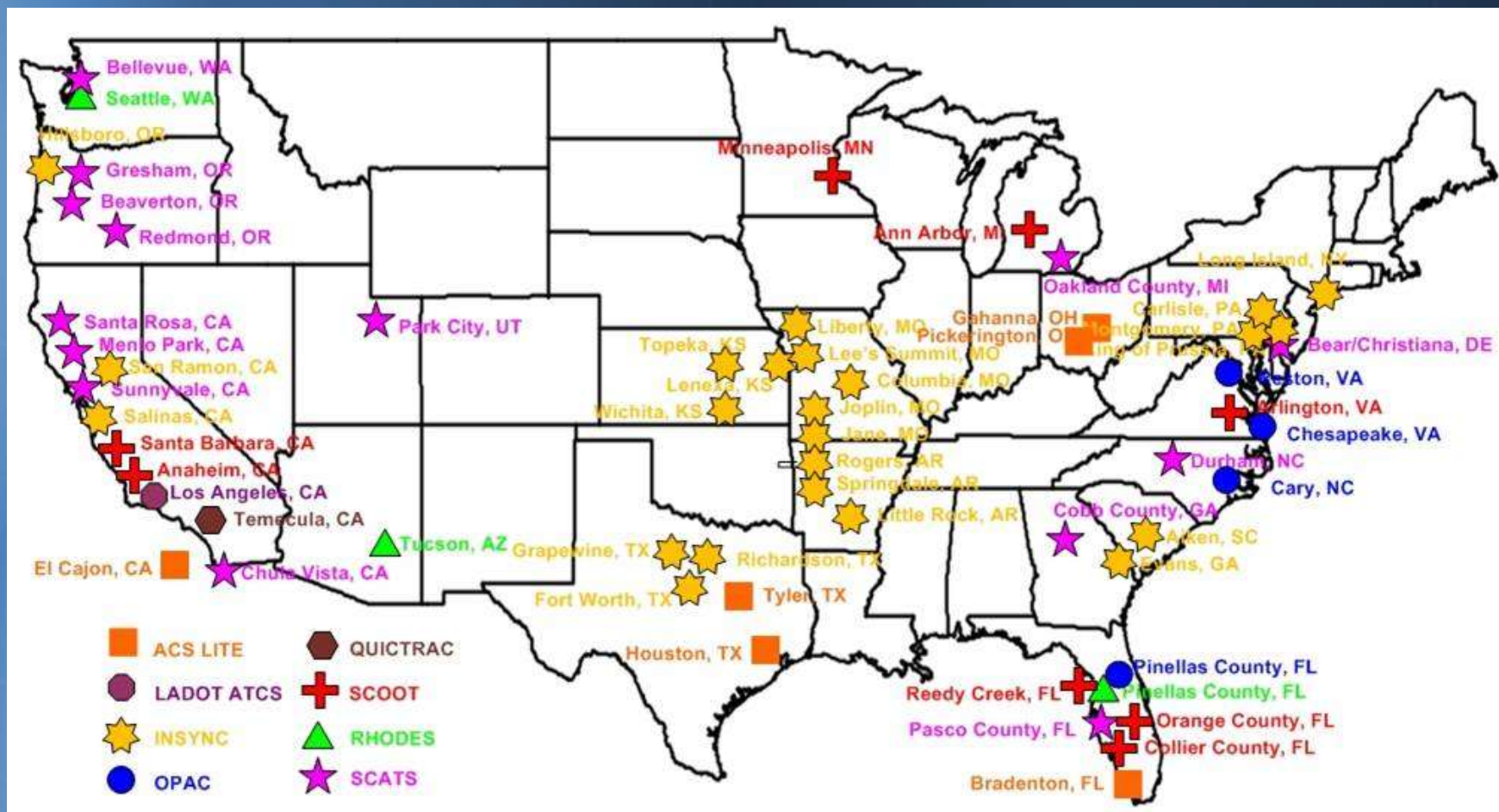
- ACSLite
- BALANCE
- InSync
- LA ATCS
- MOTION
- OPAC
- RHODES
- SCATS
- SCOOT
- UTOPIA



- QuicTrac
- NWS Voyage
- Multi-criteria Adaptive Control
- KLD
- Intelight
- Synchro Green
- System of the Month



# ASCT Deployment Status



Source: Aleksandar Stevanovic, Florida Atlantic University





# Barriers to Adoption

- Stakeholder Meeting
- Complexity
  - Model Systems Engineering Document for ASCT
- Cost
  - Planning for Operations
    - Align Arterial Operational Objectives with Planning Goals
- Uncertainty about Benefits
  - Supplement Traditional MOEs
    - Arrivals on Green
    - Green time Utilization



# The Vision

**Adaptive Signal Control Technology (ASCT)** used as an **operations strategy** where traffic demand and agency **capabilities support implementation.**



# Important Constraints

## *System Cost*

- Capital Cost
- Operations
- Maintenance
- Staff Training
- Funding Sources

## *Agency Resources*

- Operational Objectives and Philosophy
- Operations and Maintenance
- Staff skills and abilities

## *Site Suitability*

- Arterial v. grid
- Emerging congestion
- Traditional objectives unattainable
- Traditional methods failed

## *Existing Infrastructure*

- Closed loop vs Centrally managed
- Communications
- Sensor hardware
- Overall system reliability



# Goal

- By December 2012, The **EDC / ASCT tools** are used to guide the implementation or programming of 40 **ASCT** systems.
- **EDC / ASCT tools**
  - Systems Engineering Process
  - SE Workshop
  - SE Model Documents



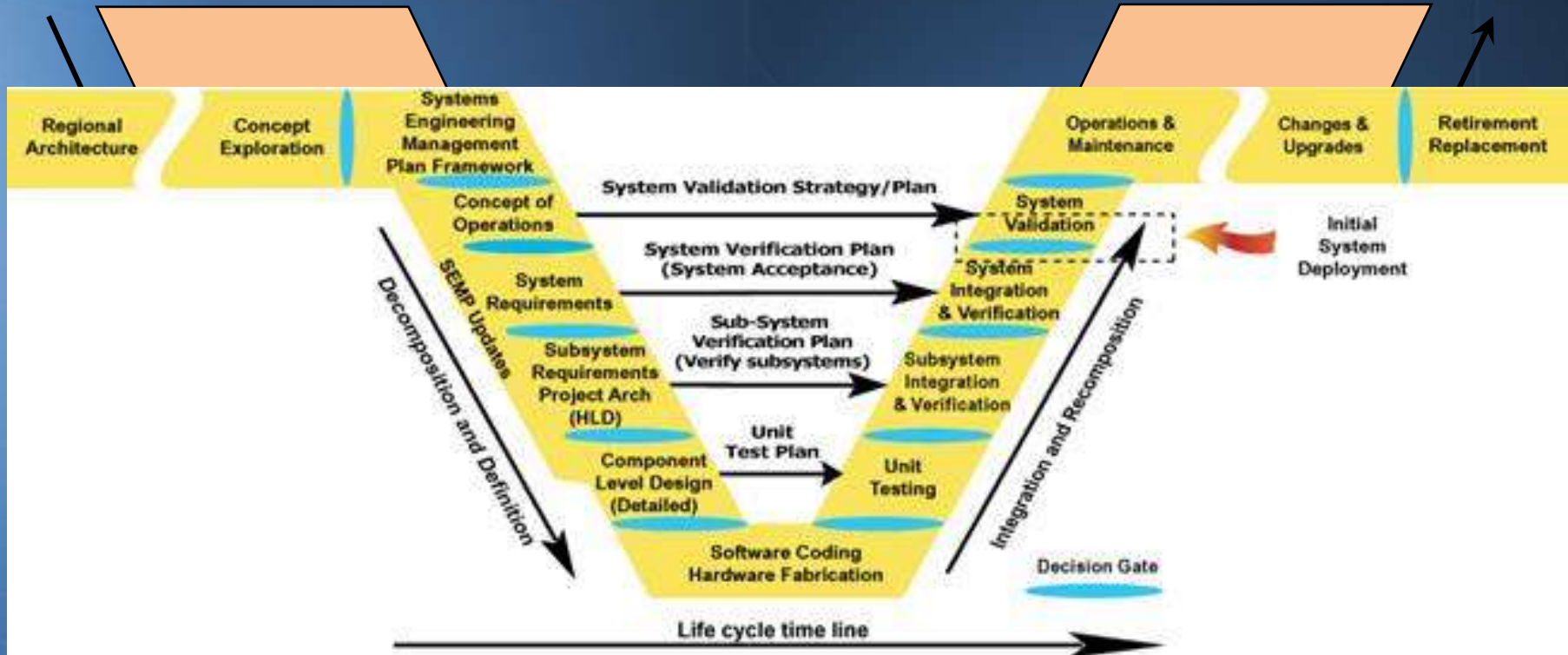


# The Role of Systems Engineering

- Rule 940 & 635
- Understanding the problem
- Managing risk
  - Projects getting bogged down with shifting requirements
  - Acquisitions being challenged by unsuccessful bidders/proposers/vendors
  - Projects not meeting agency needs
- (and it is mandatory for federal-aid projects)



# Simplified “Vee”



**Design & Implementation**

# What are my next steps?

I manage a large city, with over 1000 traffic signals, I'm considering adaptive signal control for some intersections, but how do I determine the right place for adaptive?

I'm a technologist and want to use the latest and greatest. I just heard about adaptive control and it sounds great, I want one! What do I do next to get it?

I have very old traffic control system and with my recent grant I think I can afford a new system. Is it time to consider adaptive control?

I have tried time of day coordination and even traffic responsive plan selection, but I feel like there could be something better. Could adaptive control be a better solution?

The planners are telling me that in the next 5-10 years there will be a 50% growth along the main corridor in the city, the current traffic control system will not handle the traffic based on the current capacity. Is it time to consider an adaptive control?

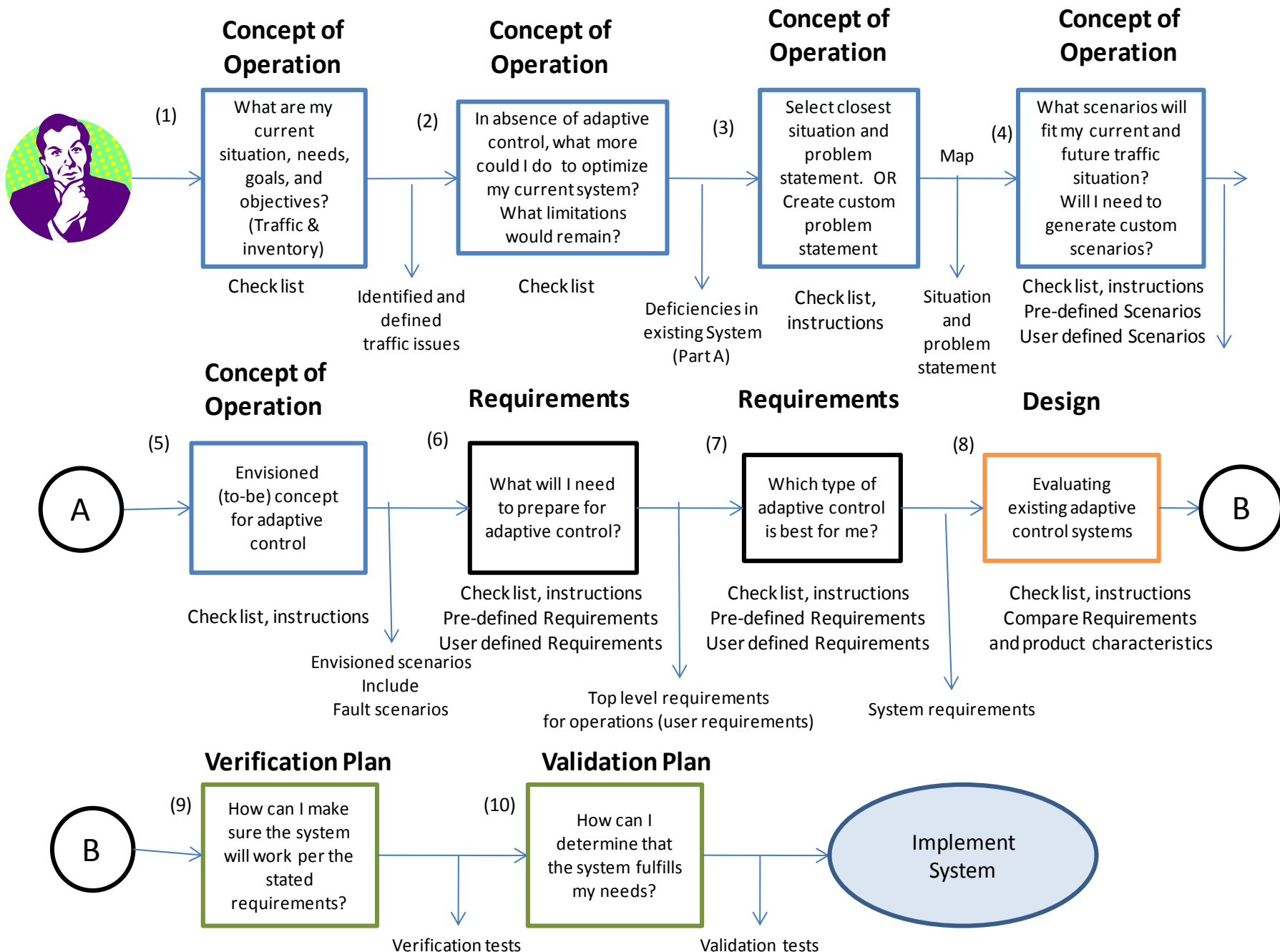
Due to new air quality standards that are out, I need to improve my network. Is it time to consider adaptive control?

I been working with my consultant/vendor for many years and they have been telling me about new adaptive traffic control systems that I should consider. What locations would be the best fit for an adaptive control system?

I am getting calls on a couple of my intersections and I cannot solve the cycle/phase issues. Will adaptive control help?

I have a corridor that I run time of day coordination, but occasionally diverting traffic overwhelms the corridor, could adaptive control provide a better solution?









# Applying the Model Systems Engineering Documents

- Is Adaptive an alternative to address needs and objectives.
- What resources are needed to operate and maintain the system.
- Guide an alternatives analysis (Procurement).




# Where Do I Get The Document?

**NTOC** TRAFFIC SIGNAL LIBRARY & FORUM

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<input type="checkbox"/>	 <b>Model Systems Engineering D...</b>	09/08/2011	1.6 MB	Eddie Curtis

Model Systems Engineering Documents for ASCT Systems is intended to provide guidance for professionals involved in developing systems engineering documents covering the evaluation, selection and implementation of adaptive systems.



# Questions?

<http://www.fhwa.dot.gov/everydaycounts>

