

# ADAPTIVE SIGNAL CONTROL - When is it the right choice?

JOINT TSITE/ITS TN FALL  
MEETING  
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Plan Design Enable

ATKINS



# Agenda

- What is adaptive signal control?
- Benefits
- Is adaptive signal control the right choice, then...
- Things to consider when selecting your system

# What is Adaptive Signal Control?

*Technologies that capture current traffic demand data to adjust traffic signal timing to optimize traffic flow in coordinated traffic signal systems*

*Capability of adjusting signal timing based on current conditions which may include adjustments to:*

*Cycle Length  
Split  
Offset  
Phasing Modifications*

# What is Adaptive Signal Control?

- How does adaptive signal control technology (ASCT) generally work?
  - Collect data in real-time from sensor systems to identify traffic conditions
  - Evaluate alternative signal timing strategies on a model of traffic behavior
  - Implement the “best” strategy according to some performance metric
  - Repeat ...



# Benefits of Adaptive Signal Control

- Reduced travel time along corridor
- Reduced intersection stop delay
- Increased average speeds
- Reduced fuel consumption
- Reduced emissions
- More efficient use of the roadway network
- Will **not**
  - Add capacity to the roadway
  - Eliminate saturation if roadway is over capacity

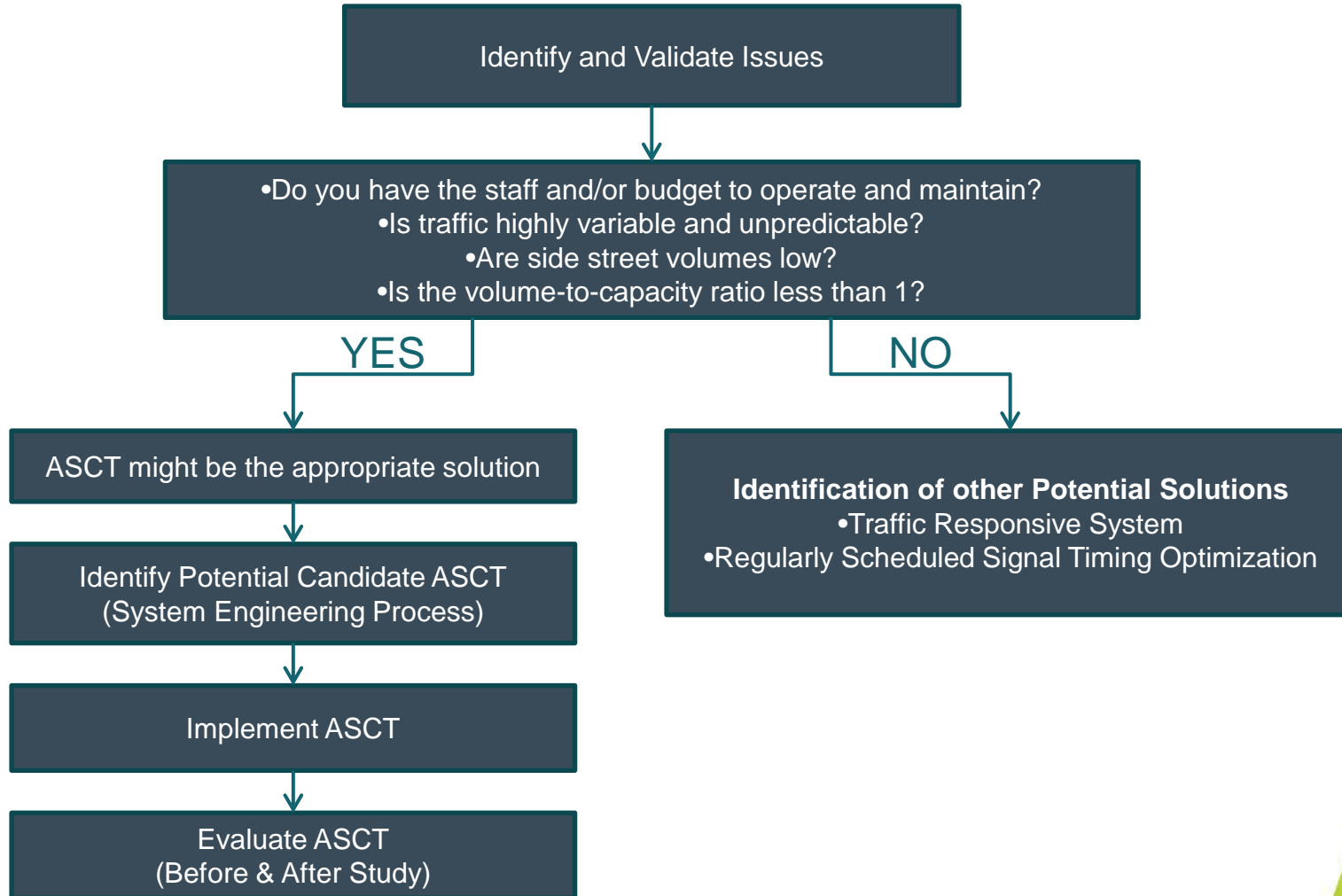
# The first step...

- Use the system engineering process to determine your:
  - Needs
  - Issues
  - Problems
  - Objectives
- Develop functional requirements
- Don't identify a solution and then look for a problem!

# Criteria for Selection

- Variability – little to no clear consistency in traffic volumes over a period of time
- Predictability – Historical data cannot be used to define consistent traffic trends

# Is ASCT the Appropriate Solution?





# Adaptive Signal Control

- Not all ASCT are the same!
  - Detection type and placement
  - Central software
  - Algorithms – how they optimize signal operations
  - Hardware needs
  - Software features
  - Cost – both initial and long-term

# Adaptive Signal Control Technologies

- SCOOT
- SCATS
- InSync
- RHODES
- OPAC
- ACS Lite
- Trafficware SynchroGreen

# Differences

- Each vendor solution may have pros and cons:
  - How to accommodate over-capacity conditions
  - Quantity or specific type of detection needed
  - Value of side street movements
  - Phasing flexibility
  - Set up time
  - On-going maintenance
  - Preemption/prioritization accommodations
- Corridor vs. grid deployment

# Agency impacts

- Initial cost (\$30k to \$65k / intersection)
  - Central software
  - Hardware
  - Detection
  - Communications
- Weekly maintenance (6 to 14 hours/week)
- Yearly operations and maintenance costs (\$1k to \$25k / intersection)
- Percent downtime (2% - 9%)
- Training (40 – 60 hours)

**NCHRP**  
SYNTHESIS 403

NATIONAL  
COOPERATIVE  
HIGHWAY  
RESEARCH  
PROGRAM

Adaptive Traffic Control Systems:  
Domestic and Foreign  
State of Practice

A Synthesis of Highway Practice

TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES

# Things to consider

- Without vehicle detection – system won't work
- Without communications – system won't work
- Increased level of training for signal staff
- Larger up front cost when compared to more traditional methods
- Not always popular with your regular commuter who expects consistency day to day – education / awareness campaigns can help this

# More things to consider

- Emergency preemption, pedestrian calls, and transit priority can create difficulties for some systems
- Working with a “black box” which may require heavy vendor reliance
- Steep learning curve
- Most adaptive systems require more detection than would be deployed for semi-actuated traffic control and traffic responsive plan selection methods

# Lessons Learned

- Generally good return on investments
- Detection is **everything**
- Basic signal timing plans must still be developed for when detection fails
- Economy of scale
- Adaptive is not a cure-all
- Adaptive is not a set it and forget it
- **Another tool for the traffic engineer's toolbox**

# Points to Remember

- Don't identify a solution and then look for a problem!
- Deployment should be based on sound engineering needs analysis
- Understand the long term implications of deployment
- Select the system that best addresses your problem and needs
- Go in with your eyes wide open
- Adaptive is not a cure-all – **IT IS ANOTHER TOOL!!**



# So, when is Adaptive the right solution?

- And the answer is:

**SOMEWHERE BETWEEN NEVER AND ALWAYS!**

# Thank you

Gerald Bolden, PE, PTOE

Atkins North America

[Gerald.bolden@atkinsglobal.com](mailto:Gerald.bolden@atkinsglobal.com)





# Understanding the limitations

- ASCT...
  - Over-saturation conditions
  - Pedestrian and bike volumes
  - Heavy reliance on detection and communications
  - Vendor support
- The agency...
  - Sufficient staff and budget to maintain the system
  - Long term commitment