Challenges for the Future of Rural Intersection Conflict Warning

NRITS 2015

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Comparative Scope of the Problem

- 6,947 fatal crashes associated with intersections in 2013 (FARS Data, US)
- 23% of the 30,057 fatal crashes in 2013
- Between 1 in 4 or 1 in 5 fatal crashes

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Closer Look

Crash Factors in Intersection-Related Crashes:
An On-Scene Perspective (NHTSA, 2010)

- 96% of crashes attributed to drivers
- 55.7% driver recognition errors
- 29.2% driver decision errors

What Do We Know?

- The crash problem is not regional it is a national issue.
- Drivers exhibit similar behavior nationwide.
- Gap acceptance/rejection appears to be a major cause
- It's not just the stopped driver, the through driver has ability to change the outcome.

Intersection Conflict Warning Systems (ICWS)

Used at stop-controlled intersections to provide drivers – on major or minor roads – with dynamic warning of other vehicles approaching the intersection

Intersection Conflict Warning Systems

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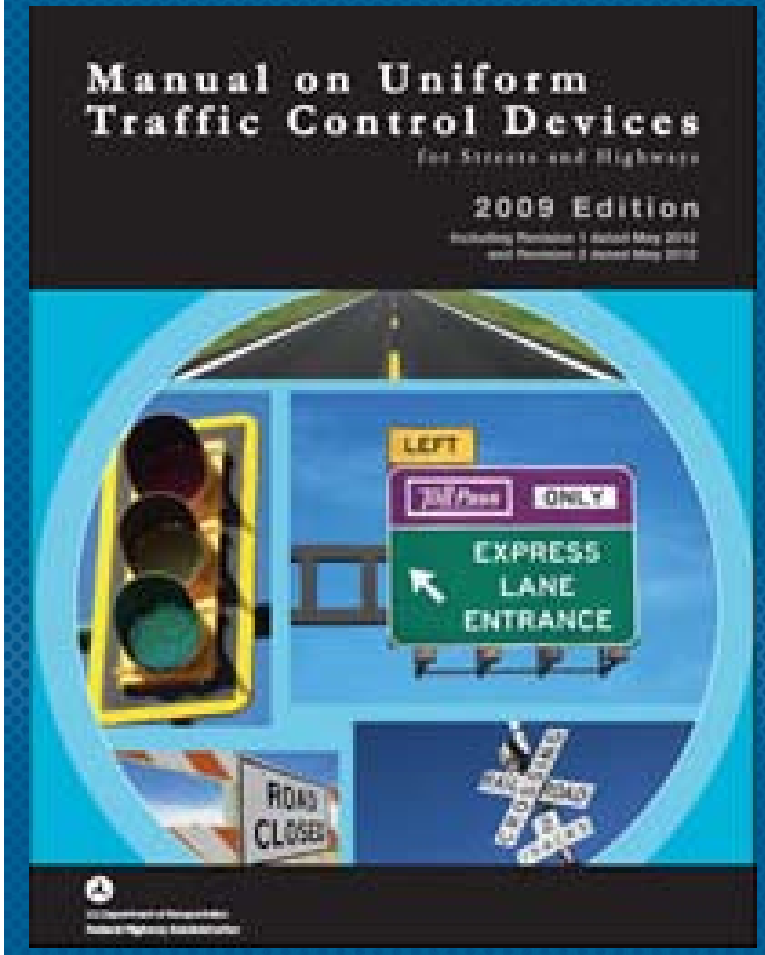
National Standards



- Proposed language for inclusion in 2017 federal Manual on Uniform Traffic Control Devices

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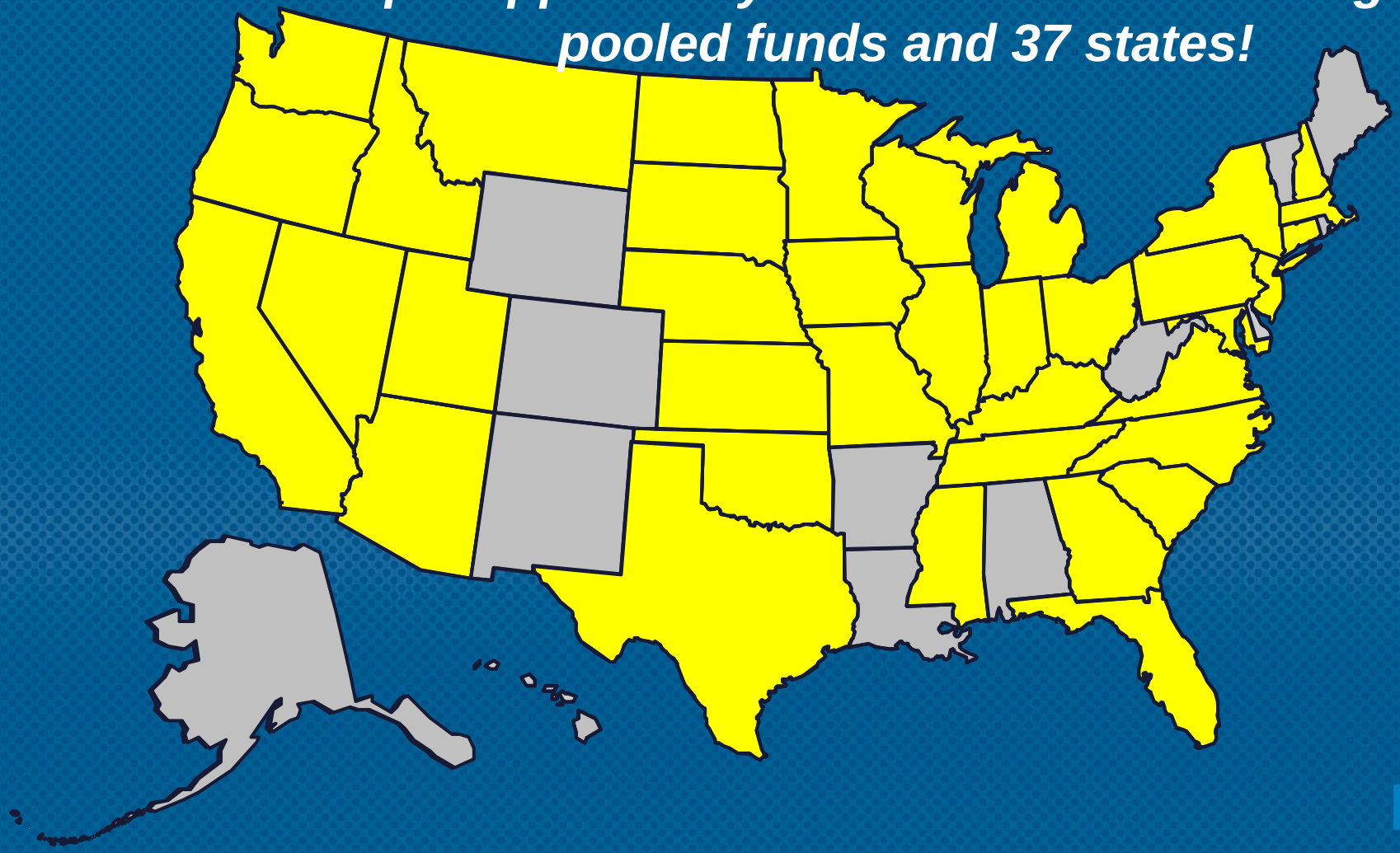
Other ICWS Stakehodersl

- What's next for others...
  - NCDOT Safety Effectiveness Evaluation
    - Major and major/minor road ICWS = 25-30% reduction (total crashes); may be higher for severe injury crashes
  - Continued deployments in other states
    - Iowa DOT, Wisconsin DOT, MnDOT Rural ICWS, SD DOT
  - Traffic Control Devices Pooled Fund TPF-5(065)
    - Human factors research on placement and legend
  - Evaluation of Low Cost Safety Improvements Pooled Fund TPF-5(099)
    - Nationally oriented safety effectiveness evaluation

Other ICWS Stakeholders

Unique opportunity for collaboration among three pooled funds and 37 states!



What do we know?

Major and major/minor road ICWS = 25-30% reduction (total crashes)*

* Evaluation of the Safety Effectiveness of “Vehicle Entering When Flashing” Signs and Actuated Flashers at 74 Stop-Controlled Intersections in North Carolina (2012)

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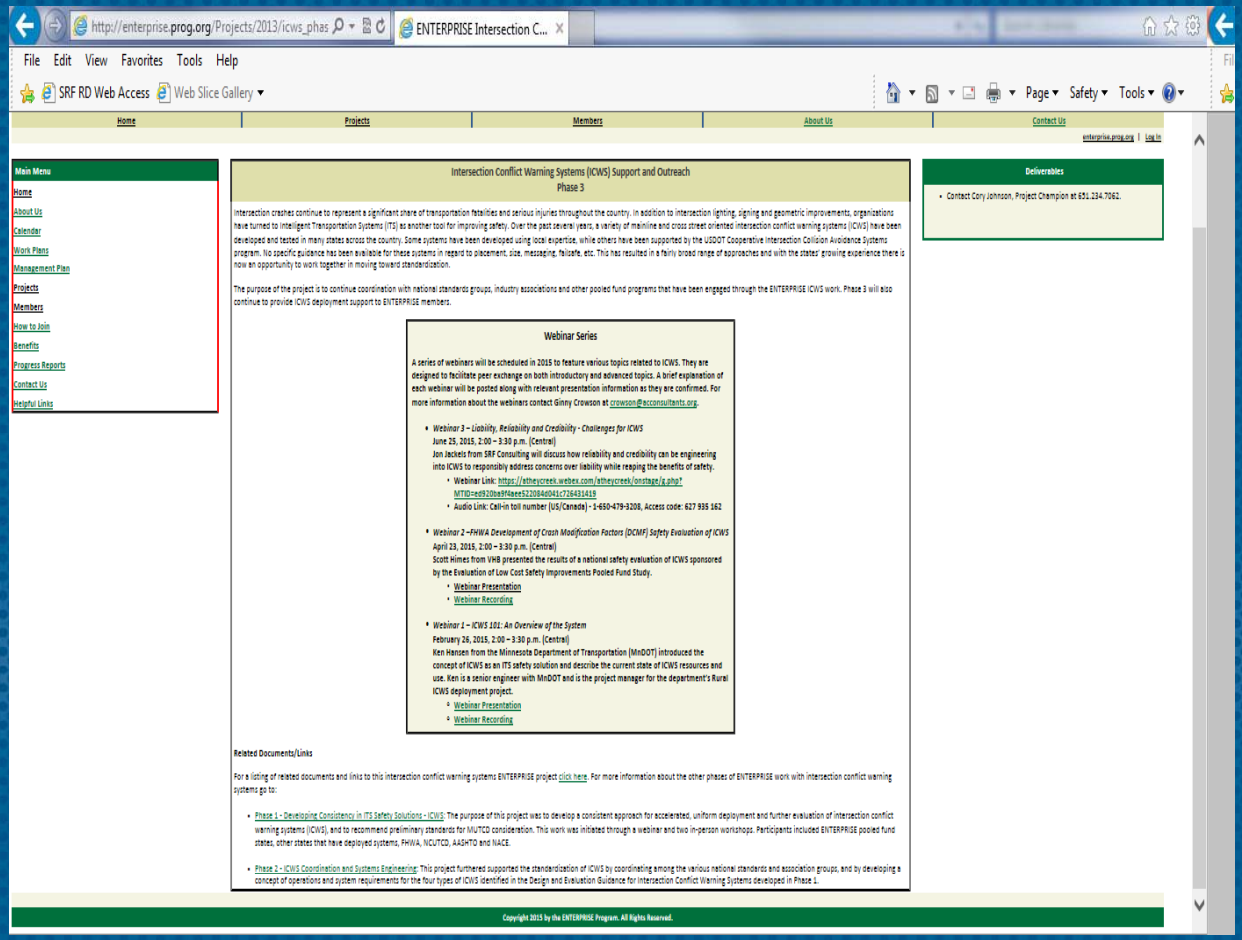
What has been done?

ENTERPRISE WEBSITE



Includes:

- **Plan Sets**
- **Specifications**
- **Evaluations**

www.enterprise.prog.org

ICWS Project - Developing Consistency

Bring together the agencies and individuals who have deployed ITS intersection warning systems to reach consensus on an approach for an accelerated uniform deployment of intersection warning systems, and a recommendation for inclusion in the MUTCD.

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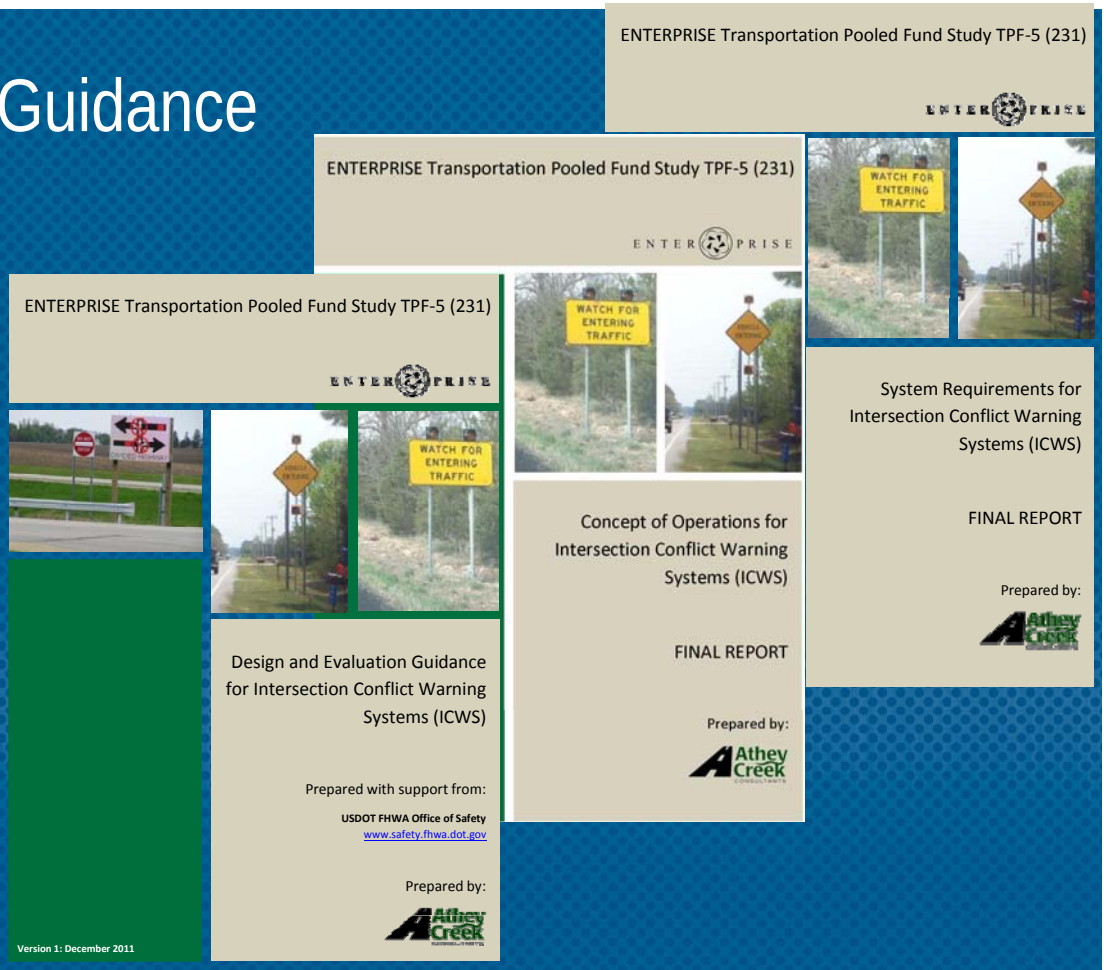
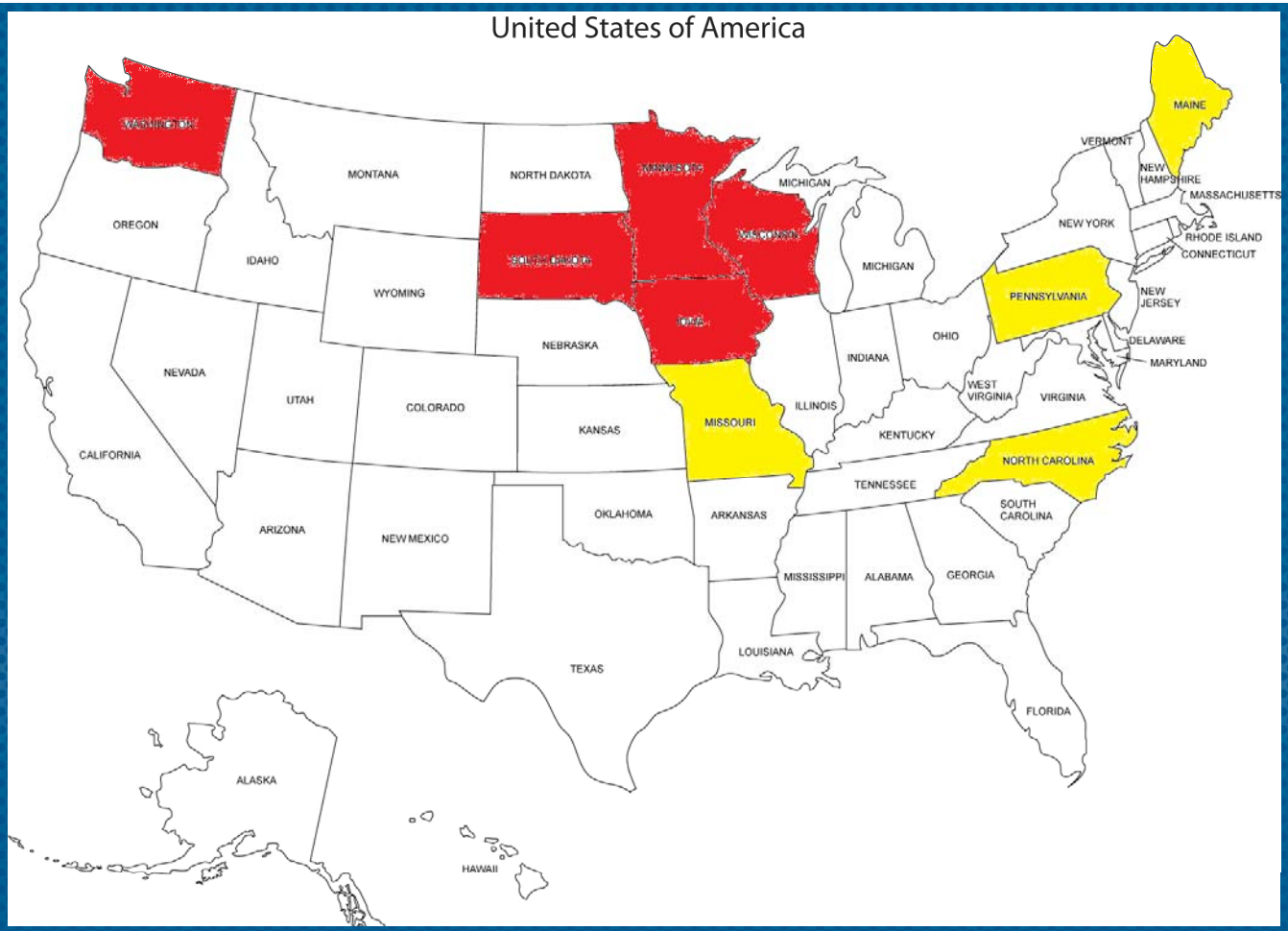
- Design and Evaluation Guidance
- Concept of Operations
- System Requirements



Do-Ability



States that have deployed Intersection Conflict Warning Systems

Why Consider a Dynamic Warning System?

- Flashing Beacon
  - Awareness of an intersection
  - Often Ignored by Local Drivers

- Dynamic Warning
  - Only when Conflicts are Present
  - Gap Acceptance
  - Vision Obscured

- Stop Sign Beacon
  - Awareness of STOP sign
  - Vehicles blowing STOP sign

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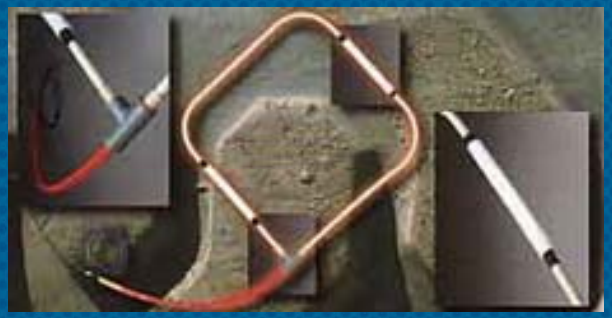
RICWS Signs

- Major Road
  - Static Sign
  - Single Beacon
  - 48x48”
  - U-Channel posts

- Minor Road
  - Blank Out
  - Double Beacon
  - 36x36”
  - Square Tube posts

RICWS Components

- Detection
  - Canoga Micro Loops
  - Loop Detectors
- Controller
  - Econolite ASC/3
- Signs
  - Blank Out
  - Static



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Today's Challenges for ICWS

- Liability
- Reliability
- Credibility
- Do-Ability

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FHWA Evaluation of Low-Cost Safety Improvements Pooled Fund Study

ICWS can be highly cost-effective as a safety treatment

B/C Ratios

- 35:1 for two-lane
- 13:1 for four-lane

Crash Modification Factors (CMF)

- 0.73 for two-lane
- 0.83 for four-lane

LIABILITY

Attorneys and Engineers Working Together to Manage Risk and Liability

Reliability and Credibility

Timely accurate information to enhance driver decision making

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Reliability

- Traditional Traffic Control Devices
  - Visible and function as designed
  - Maintained

- Dynamic Warning Systems
  - Visible and function as designed
  - Maintained

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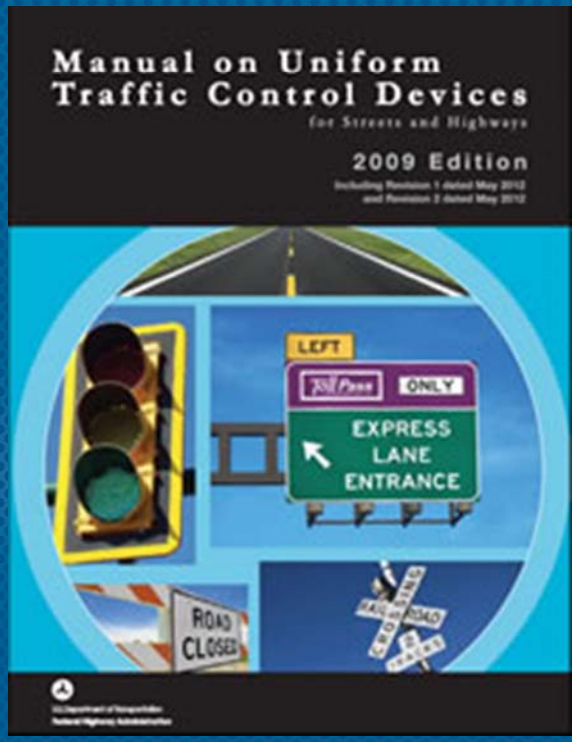
Effectiveness

- Fulfill a need
- Command attention
- Convey a clear, simple message
- Command respect from road users
- Give adequate time for proper response



Credibility

Driver must view traffic control devices as credible

Reliable Power

- Grid Power
  - Performance history
  - Consider battery back-up
- Solar / Wind Power
  - Geographic area
  - Meet power needs

Malfunction Display

ACTIVE **INACTIVE** **MALFUNCTION**

24 HOUR FLASH

Accuracy of Response

What accuracy is required?

For 3000 entering vehicles:

- 99.95% allows 1.5 missed activations per day
- 95% allows 150 missed activations per day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Minnesota Department of Transportation
Rural Intersection Conflict Warning System (RICWS)
Reliability Evaluation

Final Report

Arvind Menon
Max Donath

Department of Mechanical Engineering
University of Minnesota

CTS 14-07

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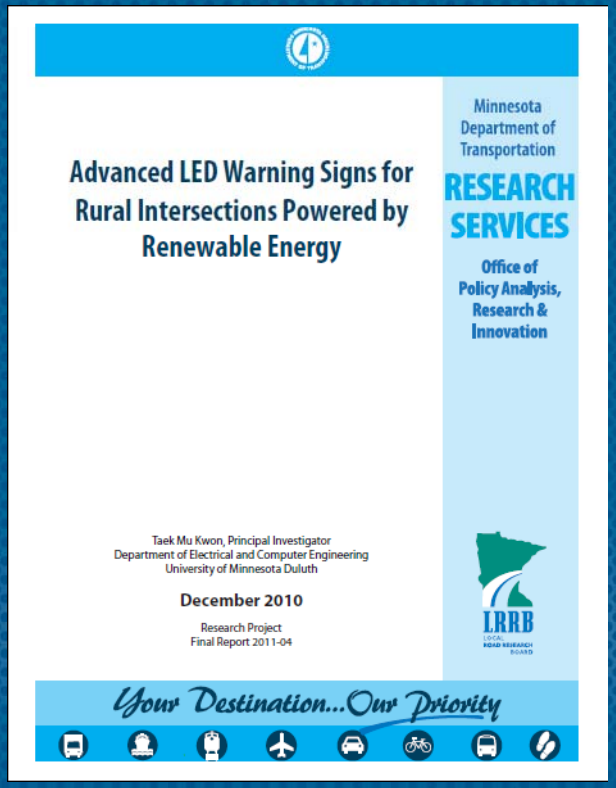
System Repair and Maintenance

Establish a maintenance plan with appropriate response times.

Driver Behavior

ICWS changes driver behavior

- Before 13% roll through
- After
  - 0% roll through when active
  - 24% roll through when inactive



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How to Turn Challenges into Knowledge

- Systems Engineering
- Design Decisions
- Testing and Validation Results
- Maintenance Logs

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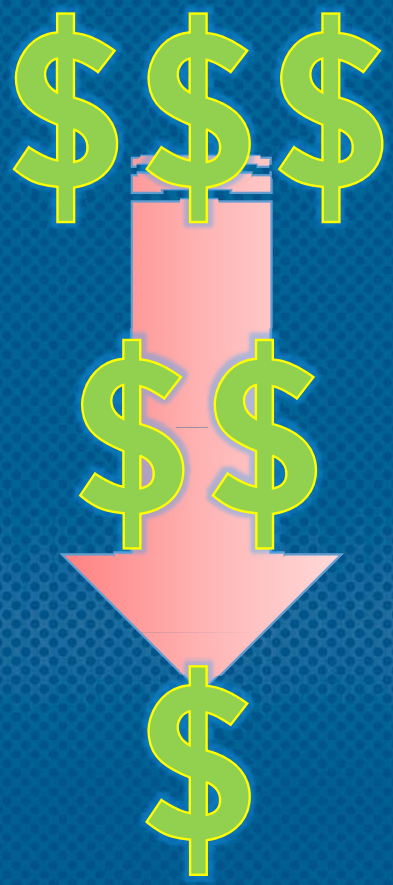
Costs

$40,000 to $140,000

- Design Costs?
- Installation Costs?
- Annual Maintenance?

Safety Solutions

- Geometric Improvements
  - reduce conflicts
  - improve sight distance
- Dynamic Warning Systems
- Street Lighting
- Flashing Beacons
- Enhanced Signing, Delineation, and Pavement Markings



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