Connected Vehicle (CV) Technology Procurement State of the Practice Analysis

Summary Findings

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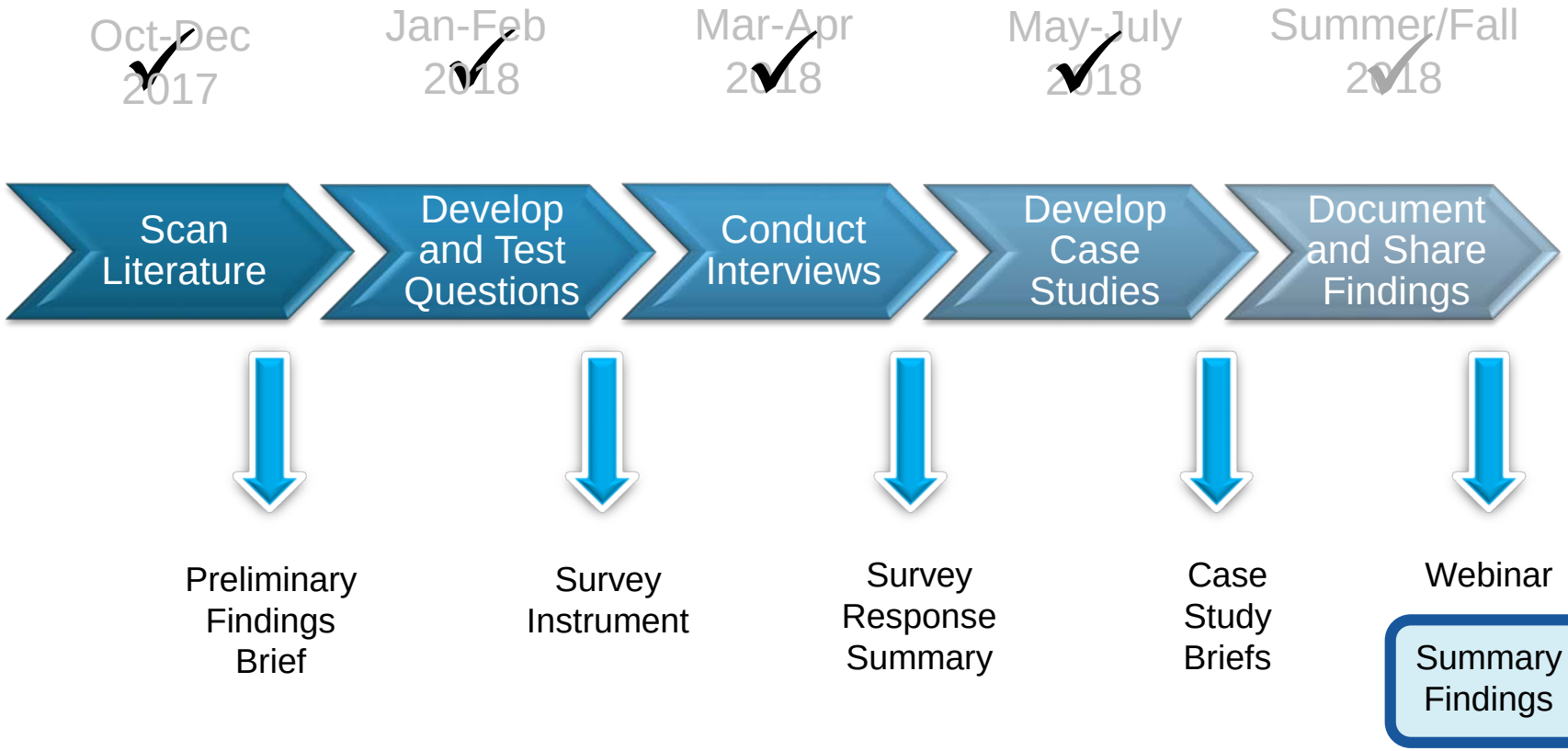
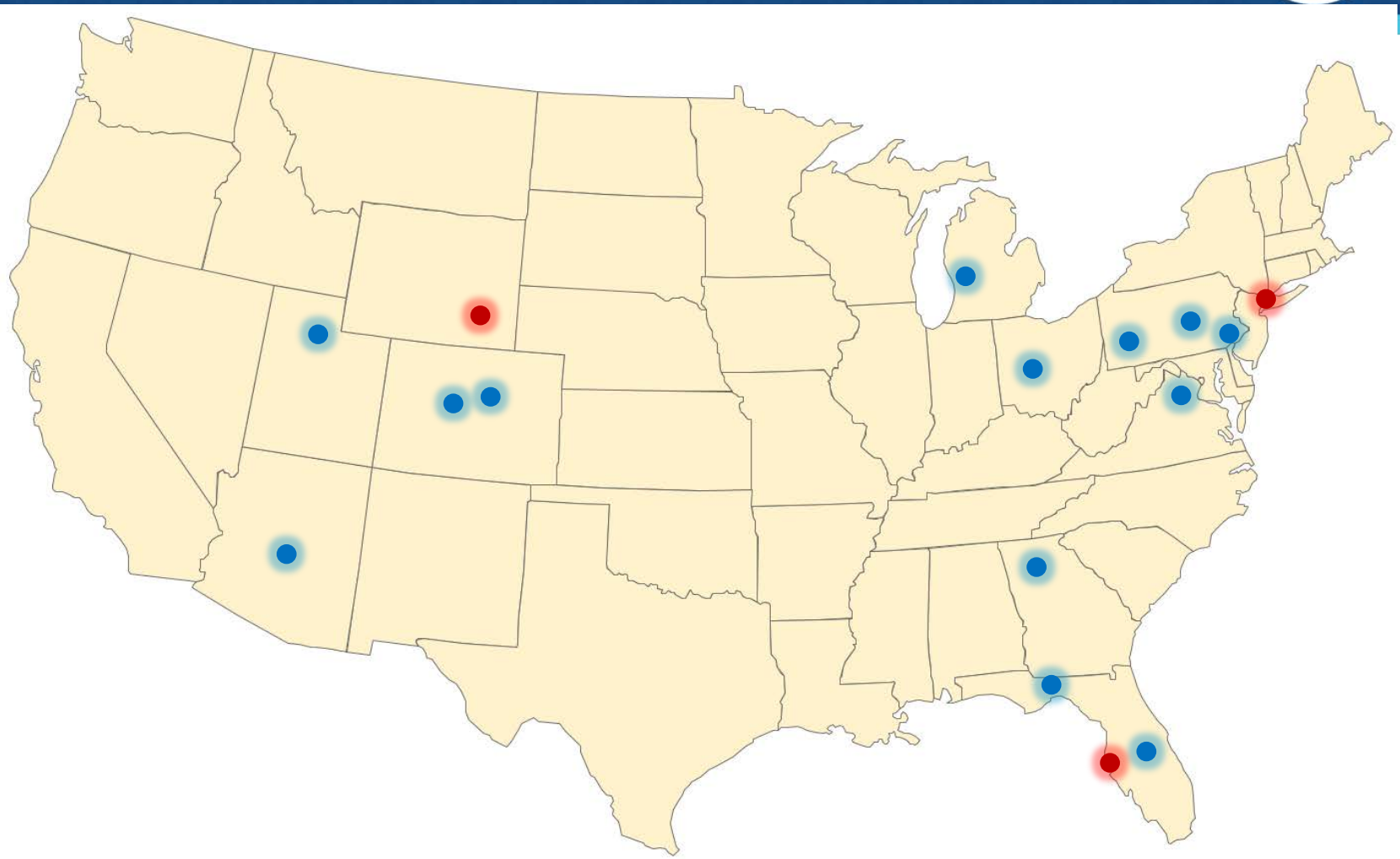
CV Procurement Analysis
Purpose

- Research and assess current state-of-the-practice for CV Procurement
  - How do transportation agencies purchase (or plan to purchase) ITS CV equipment, systems, and services?
  - “Case study” agencies to provide different real-world examples
- Document challenges, lessons learned, and recommendations from early CV deployers
- Identify potential actions for US DOT to facilitate successful CV procurements

CV Procurement Analysis
Research Plan Overview



CV Procurement Analysis
Projects/Sites Surveyed



Legend:
- CV Pilot Site
- Interviewed CV Deployment Location

CV Procurement Analysis
Projects/Sites for Contacts Interviewed (11)

- Maricopa County, AZ (Anthem, AZ)
- State of Colorado
  - Denver, CO
    (Smart City ATCMTD Grant)
  - I-70, statewide
- State of Florida
  - Tallahassee, FL
  - Osceola County, FL
- Atlanta, GA
- State of Michigan
- Marysville, OH (ATCMTD Grant)
- State of Pennsylvania
  - Pittsburgh, PA
  - Harrisburg, PA
  - Philadelphia, PA
- State of Utah
- Commonwealth of Virginia

CV Procurement Analysis
Top Motivators for Interest in Deployment

- **Improve Safety!**
  - "Move the needle on safety"
  - Most interviewees mentioned safety as an important goal (#1 motivator)
  - Chance to have a significant impact
- **Improve Mobility and Operations**
  - Manage congestion
  - Enhance access to employment
  - Reduce environmental impact
- **Facilitate Economic Growth/ Stimulate the Economy**
  - Attract high technology businesses/ Support job creation
  - Encourage testing
  - Develop partnerships
- **Support Agency Goals and Direction**
  - Agency sees CV as the future and wants to be out in front
  - Strong leadership and upper management support exists for CV
  - Desire to test the new technologies/equipment
  - Meet the SPaT challenge

CV Procurement Analysis
Planned/Procured CV Applications

- **Safety Applications**
  - Pedestrian crossing/bike safety
  - Red light violation warning
  - School zone/work zone warning
  - First responder preemption
  - Spot weather warning
  - Curve speed warning

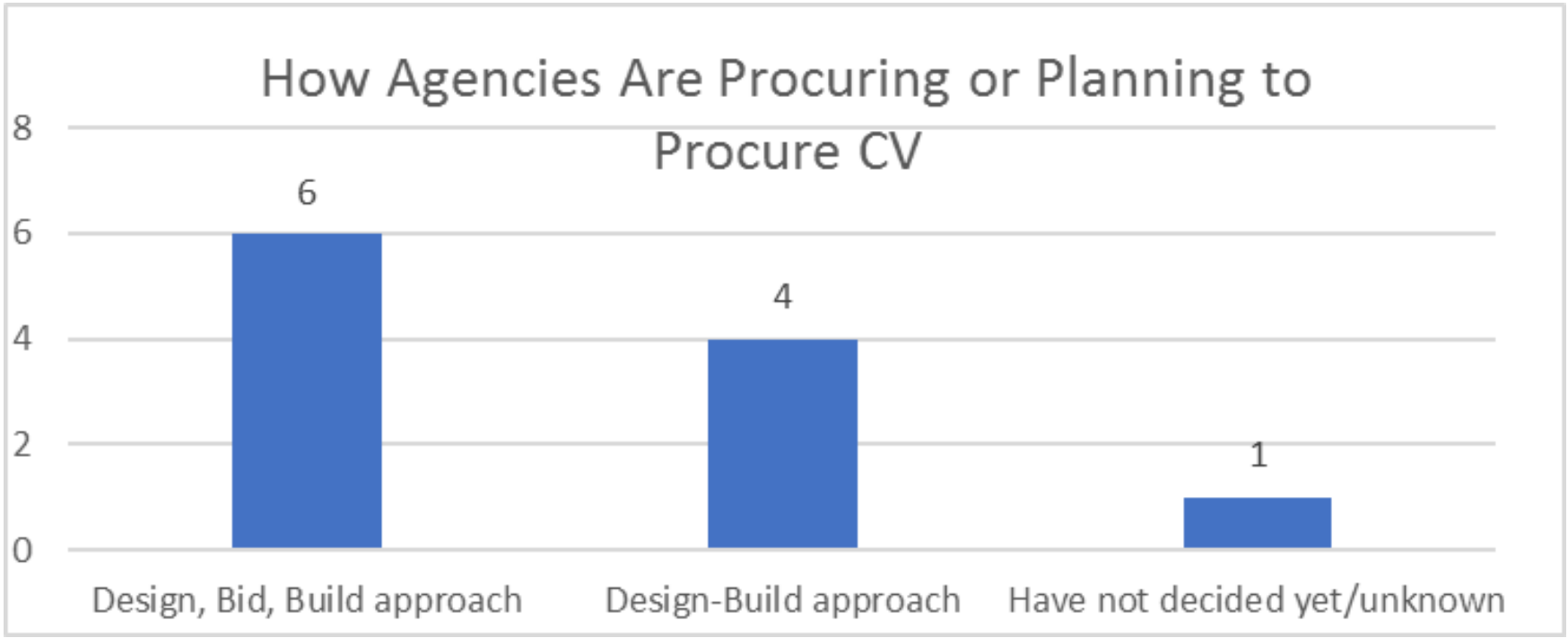
- **Data Environment Applications**
  - SPaT/MAP
  - Probe-enabled traffic monitoring
  - Integrated data environment

- **Mobility and Environmental Applications**
  - Multimodal Intelligent Traffic Signal Systems (MMITSS)
  - Adaptive signal control
  - Transit priority
  - Snowplow priority
  - Speed harmonization
  - Queue warning
  - Traveler information
  - Dynamic ridesharing
  - Virtual Active Traffic Management
  - Eco-approach and departure

CV Procurement Analysis
Systems Development Approaches

- Interviewees reported that their CV projects have **moderate to substantial software development** requirements
- Most projects are being developed using the **Vee Development Model**
- Use of **Agile/Scrum methods** was reported by a few interviewees and appears to be **emerging as a trend** for larger projects
- A few interviewees said they were using a **phased approach**
- Several reported use of U.S. DOT guidance based on **CV pilots documentation** to assist with their approach

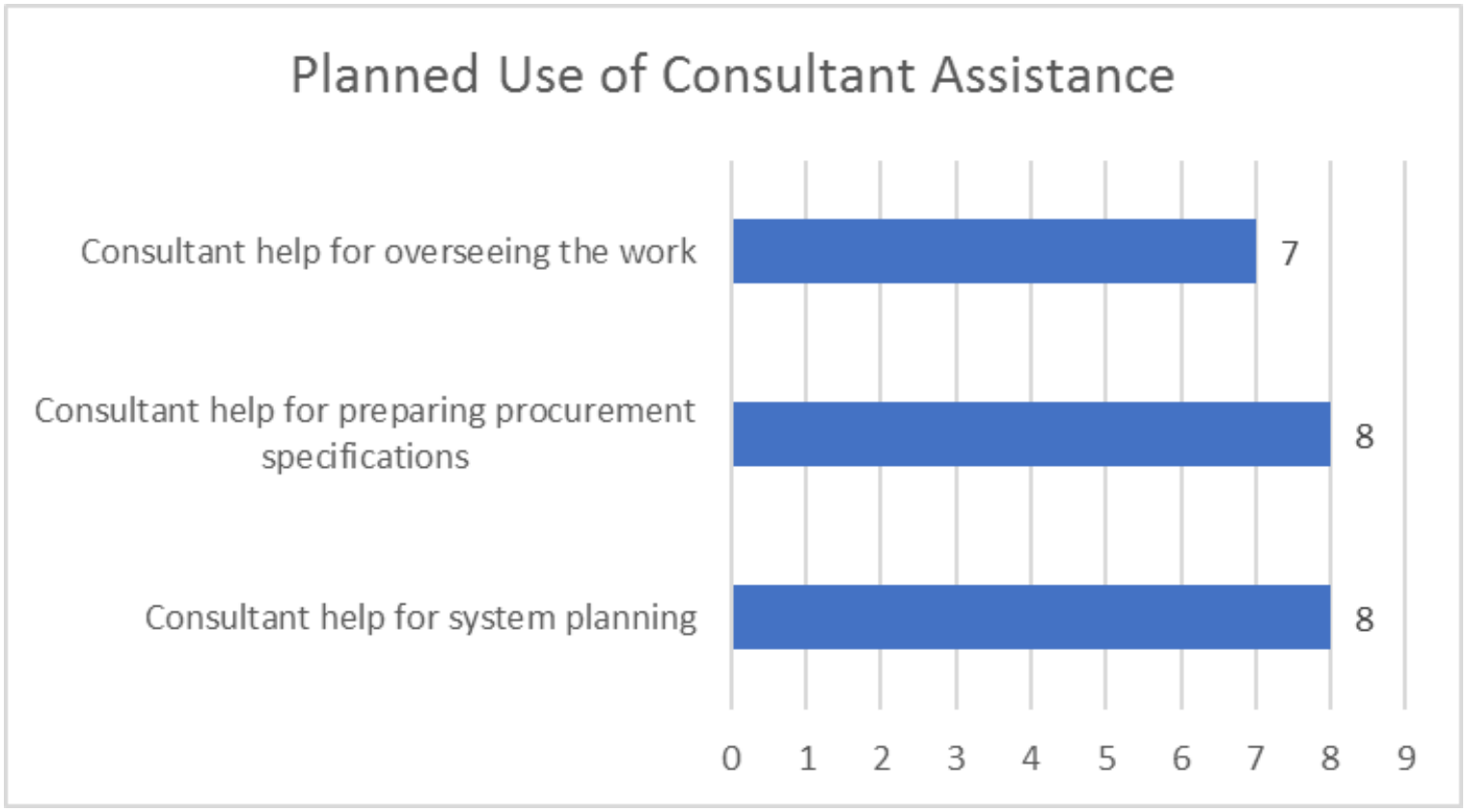
CV Procurement Analysis
Overall Procurement Approach



(Operate-Transfer)

n=11

CV Procurement Analysis
Consultant Assistance



**Respondent could select multiple answers*

n =11

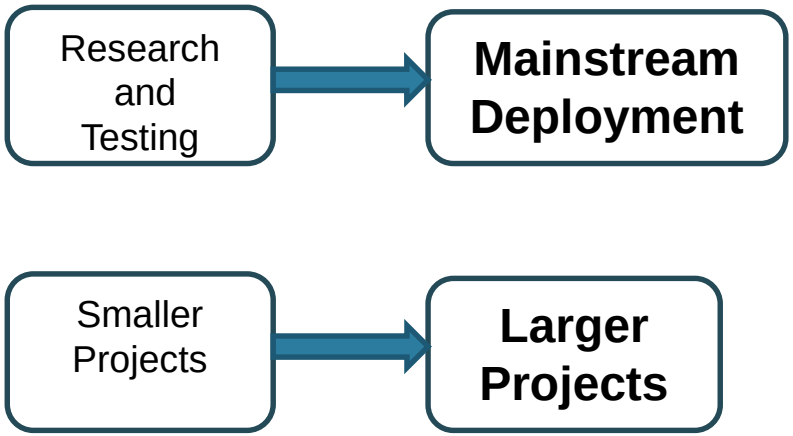
CV Procurement Analysis
Contract Types and Method of Award

- **Contract Types**
  - Most agencies are using **firm fixed-price contracting** (for base tasks)
  - **T&M (Time & Materials)** is next most frequently used
  - Optional tasks tend to be done using a T&M approach
- **Method of Award**
  - Most agencies appear to be able to use **both qualifications and cost factors** in selecting contractors
  - One agency used a sole-source method of award to bring on a contractor
  - For buying equipment (esp. large quantities), public agency may be more limited on method of award
    - Specifications must be very good to enable correct vendor choice
    - If purchase will be made by contractor or another party, public agency can still participate in selection

CV Procurement Analysis
Overall Observations

- **Contractor roles vary, but DOTs are giving them a lot of responsibility**
  - Several DOTs have design-build (-transfer) or (–operate-transfer) contracts with contractors
  - Several DOTs are using traditional design – bid – build approach
  - Some DOTs have used both of these approaches for CV projects
  - Most agencies surveyed are using contractor/consultants to perform or assist with project planning, project specifications, and oversight (systems manager roles) as well as a systems integration role
- **Some agencies are partnering with universities**
  - Especially for early stage deployments and testing
  - Universities often purchased the DSRC equipment for testing and research purposes
- **Many agencies still do not have direct experience with CV procurements**

CV Procurement Analysis
Observed Trends



- Scope Expanding from SPaT/MAP only to Multiple Applications
- Increasing Use of Design-Build-Operate-Transfer Approach
- Increasing Use of Agile Development Methods

CV Procurement Analysis
Procurement Challenges Faced

- **Growing pains of a young market**
  - Robust, mature marketplace still isn't there today
    - Very low market penetration for intersections, roadside, and vehicle equipment
  - Vendors are still fine tuning equipment and software and **working interoperability issues** associated with deployment
  - **Standards** and **technology** are **still evolving**
  - Vendor interoperability claims may not translate to your environment
  - RSU vendors **not always compatible** with varying signal controller equipment across the state
  - Not yet ready for high volume production of devices

CV Procurement Analysis
Procurement Challenges Faced (2)

- **Specifying requirements correctly** to ensure good choice of vendor
- **Communication problems** with procurement staff
- Understanding and **executing FCC licensing process**
- **Funding** may not be readily available for large-scale CV projects
  - Some areas take advantage of the grant programs such as ATCMTD to jumpstart CV deployment efforts
- **Lack of federal mandate and uncertain outlook for DSRC**
  - Changes public agency procurement and market forecast
  - Vendors want to be sure the technology will be used prior to investing more money into research and product development

CV Procurement Analysis
Recommendations and Best Practices

Procurement Planning

- **Explore your contracting options for** purchasing CV equipment such as communication devices, RSUs, and OBUs
- Find a way to **test potential offerors equipment** with your signal equipment, controllers, and related infrastructure as part of your overall procurement strategy and vendor selection process
- **Source early in the process to help meet schedule goals**
  - Obtain sourcing commitment from suppliers so that they can gear up to meet needed demand for equipment and work with you
- For big CV purchases with large quantities, **consider contracting with multiple vendors to maximize flexibility** and manage the risk of not meeting delivery targets
- **Consider technology and standards evolution** in procurement and deployment strategy

CV Procurement Analysis
Recommendations and Best Practices (2)

- **Make use of CV resources** offered by the ITS Joint Program Office (JPO), National Operations Center of Excellence, etc.
- **Use the right expertise**
  - **CV subject matter experts**
  - Partner with colleagues that have **contracting and legal expertise**
  - Secure access to **expertise in FCC licensing** process for DSRC
- **Communicate effectively!**
  - CV technology is new and can be challenging to understand
  - Involve your contracting and procurement personnel from the beginning of the project
  - Consider use of liaisons to accelerate effective communications
  - Understand and be able to communicate the ultimate CV outcomes or benefits
  - Ask for help when you need it

CV Procurement Analysis
Recommendations and Best Practices (3)

- **Plan for ongoing vendor support during testing and initial operations stages**
  - Consider use of service-level agreements
- **Start small to improve chance of success on bigger projects –** begin on a small scale with your CV deployment before you tackle a large-scale project
- **Consider ways to approach CV project development and procurement that are more flexible** than the approach of fully specifying and documenting all requirements upfront
  - Consider phased or agile approaches
  - Consider service provider model approach for CV deployments

CV Procurement Analysis
Recommendations and Best Practices (4)

Installation and Testing

- Plan for hardware and software issues to occur during early testing periods
- Maintain vendor support to address problems during this period
- Use simple, rudimentary installs for prototype OBUs during testing period to find problems, investigate antenna placement, etc.
- Realize that unique installation procedures are needed for special equipment like snow plows
- Build dashboarding type tools to track performance of procurement and installation activity

CV Procurement Analysis
Recommendations and Best Practices (5)

Schedule Considerations

- Plan time in the schedule for achieving required levels of approval/sign-off for large procurements
- ***Be conservative in your OBU installation schedule projections***
  - If installing OBUs in private vehicles, be aware that many people will not keep their selected appointments
  - May run into unique installation problems with different model vehicles
- **Allow sufficient time** in the schedule **for component and integration testing**

CV Procurement Analysis
Knowledge And Technology Transfer (KTT) Recommendations

- Highest priority information need appears to be **model procurement documentation, case studies, and project examples**
  - **CV Pilots website**
    - *"CV Pilot documentation has been very helpful in our state & local projects."*
  - SPaT Challenge Procurement Resource
  - Informal networking
  - 3 case studies included in the final report for this project
- **Interviewees also interested in guidance, participating in peer exchanges, and direct technical assistance** on the topic of CV procurement
  - *"Provide model documentation and guidance."*
  - *"Facilitate a cyber security cohort and other peer exchanges for deployers" ….(continues next slide)*
  - *"Create/develop a contracting approach and mechanism that works well for projects developed using Agile/Scrum methods"*

CV Procurement Analysis
Knowledge And Technology Transfer (KTT) Recommendations (2)

- **Funding opportunities**
  - *"Sponsor additional USDOT CV projects to assist deployers in understanding the undertaking of CV projects and their corresponding benefits"*
  - *"Focus more resources for large-scale CV deployments, based on CV-Pilot experiences"*
  - Develop factsheets explaining potential near term funding sources for CV deployment

- **Training offerings**
  - *"Provide training on network infrastructure and technology behind CV"*
  - *"Educate agencies across the country on CV and AV technologies"*

CV Procurement Analysis
Other Recommendations for USDOT

- *"Stabilize standards and certification environment"*
- *"Serve as technical advisor role by highlighting best practices"*
- *"Support peer exchange of data to consolidate and share information"*
- *"Continue to pull out effective things that are learned in the CV Pilots"*

Closing

- Next steps?
  - Finalize documentation
  - Continue to share results

CV Procurement Analysis
Points of Contact

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