

IntelliDriveSM

Vehicle to Infrastructure Connectivity for Safety Applications

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www.IntelliDriveUSA.org

Presentation Overview

- Focus of V2I Safety
- Detailed presentation of the roadmap activities
 - Highlight Key Objectives and Major Outcomes
- Prepare for later Breakout discussion

Acknowledgements

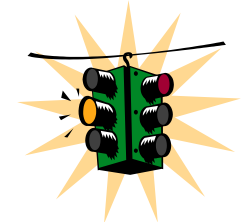
- Mike Schagrin, RITA
- Gregory Davis, FHWA
- Deborah Curtis, FHWA
- Edward Fok, FHWA
- James Arnold, FHWA
- Carl K. Andersen, FHWA
- Bernadine Victor-Taylor, Noblis

Safer Driving in the V2I Environment

- Greater situational awareness
Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see
- Reduce or even eliminate crashes thru:
Driver Advisories
Driver Warnings
- Focus is DSRC 5.9 GHz and crash prevention
- Communication can be **to or from** vehicle, infrastructure, and/or nomadic/aftermarket devices
- All vehicle types and pedestrians **will be considered**



Instrumented
Roadside



Signal Phase and
Timing



Equipped
Vehicles



Aftermarket or
Retrofit Devices

V2I Safety Focus Areas

- Intersections
- Speed Management
- Run-off road and lane departure
- Enforcement and Operational Safety for Commercial Vehicles and Transit

V2I Safety Research Plan

Track 1 – Applications Analysis

Selection of Safety Applications (January 2011).

Track 2 – Prototype Development

Develop concept of operations, application requirements, and design, build and test applications.

Track 3 – Infrastructure Communications/Interoperability

Test and evaluate SPaT, *issue SPaT Policy Guidance (2Q 2013)**.

Test and evaluate Mapping and Positioning solutions.

Test and Evaluate Communication Requirements.

Track 4 – Benefits Assessment

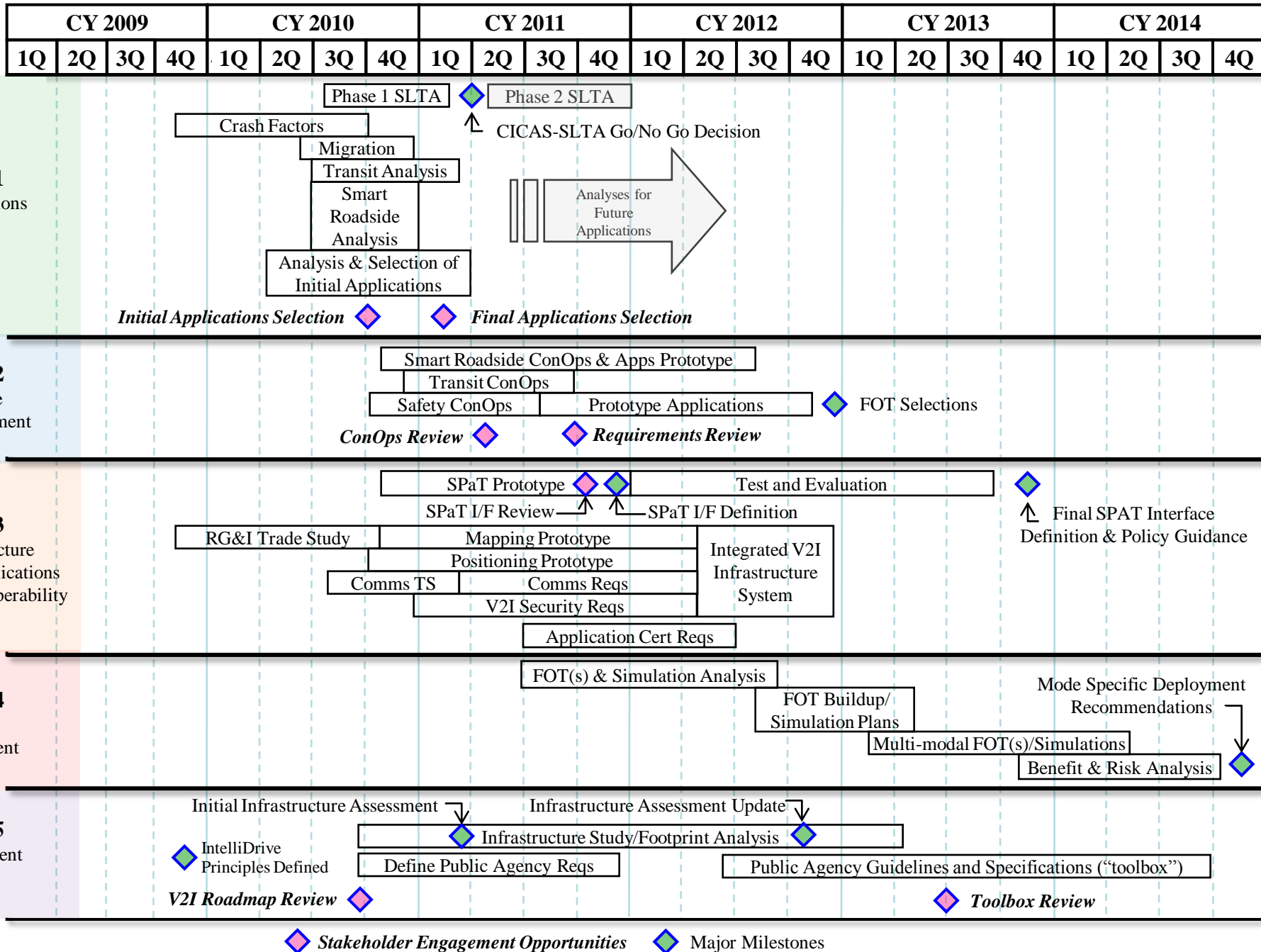
Perform FOTs based on selected safety applications.

Analyze data for measuring safety benefits.

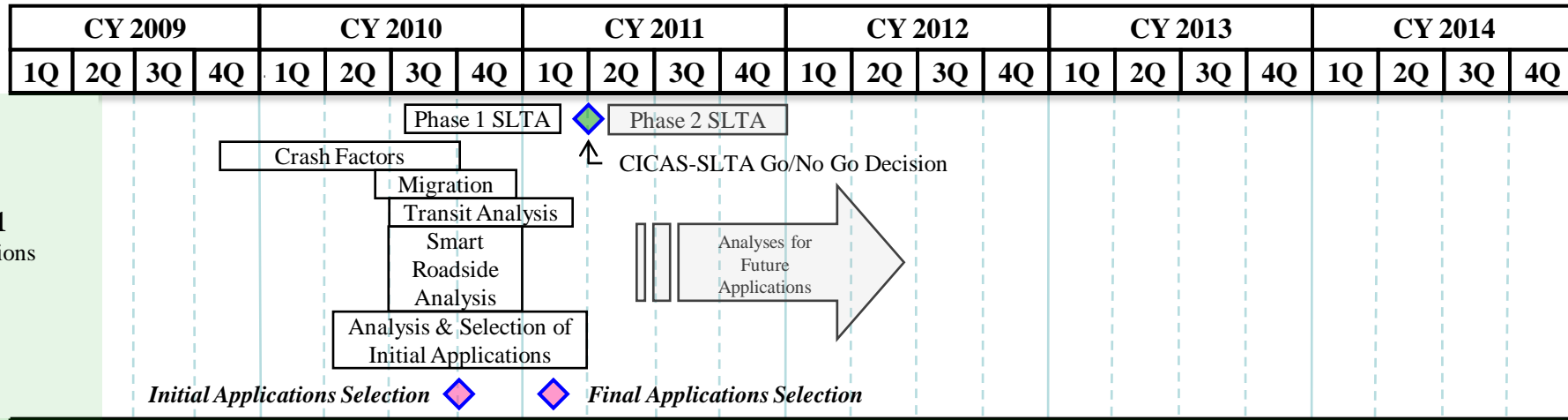
Track 5 – Deployment Planning (ongoing)

Development of Public Agency Guidelines and a Toolbox for practitioners.

V2I Safety Applications Roadmap – Draft July 12, 2010



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Track 1
Applications
Analysis

TRACK 1 – Applications Analyses

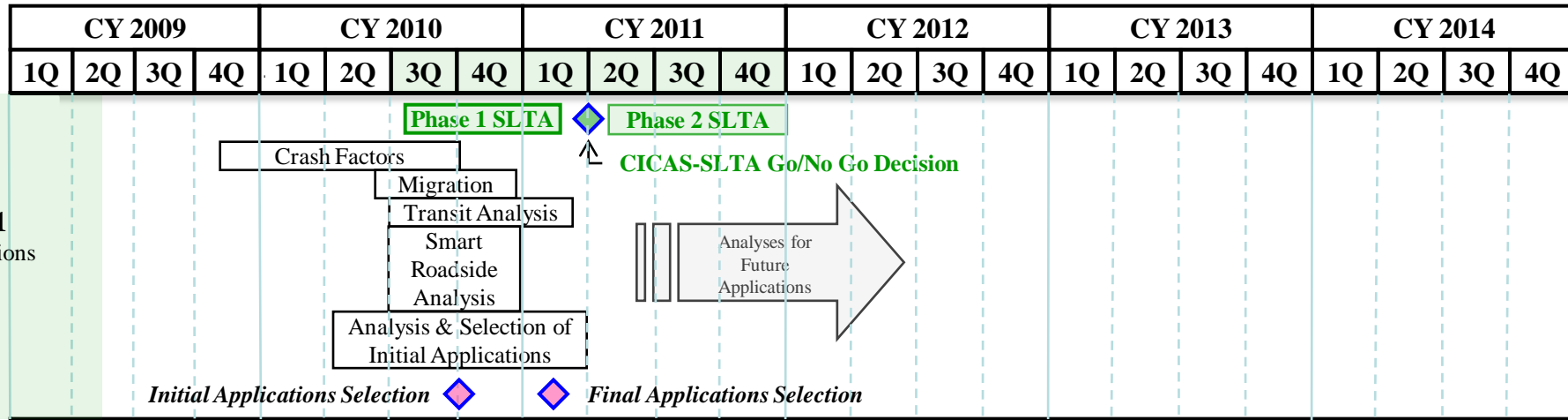
Key objective: Determine high value safety applications for initial V2I safety deployment.

Major outputs: A set of applications that will be further developed in Track 2.

Items to be covered:

- Status of CICAS-SLTA
- Multimodal Applications Analyses
- Selection of Safety V2I Applications

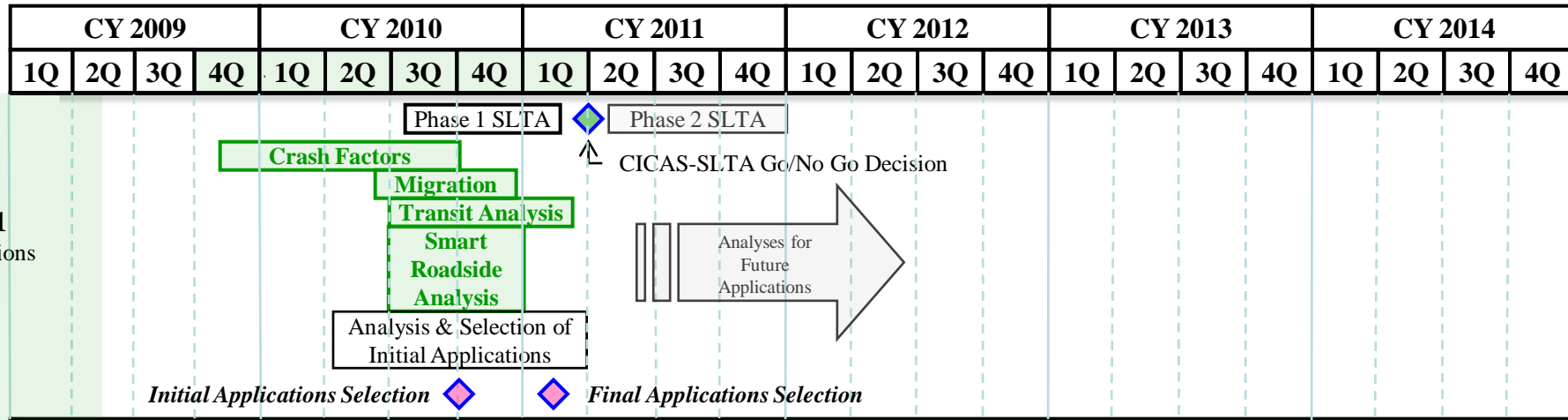
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Cooperative Intersection Collision Avoidance System – Signalized Left Turn Assist (CICAS-SLTA):

- Investigate how to warn drivers when it is unsafe to make a left turn on a permissive green at signalized intersections.
 - Phase 1 – Warning algorithm
 - ◆ Go/No Go Decision – Is algorithm effective & reliable?
 - Phase 2 - Develop prototype & determine feasibility for implementation.

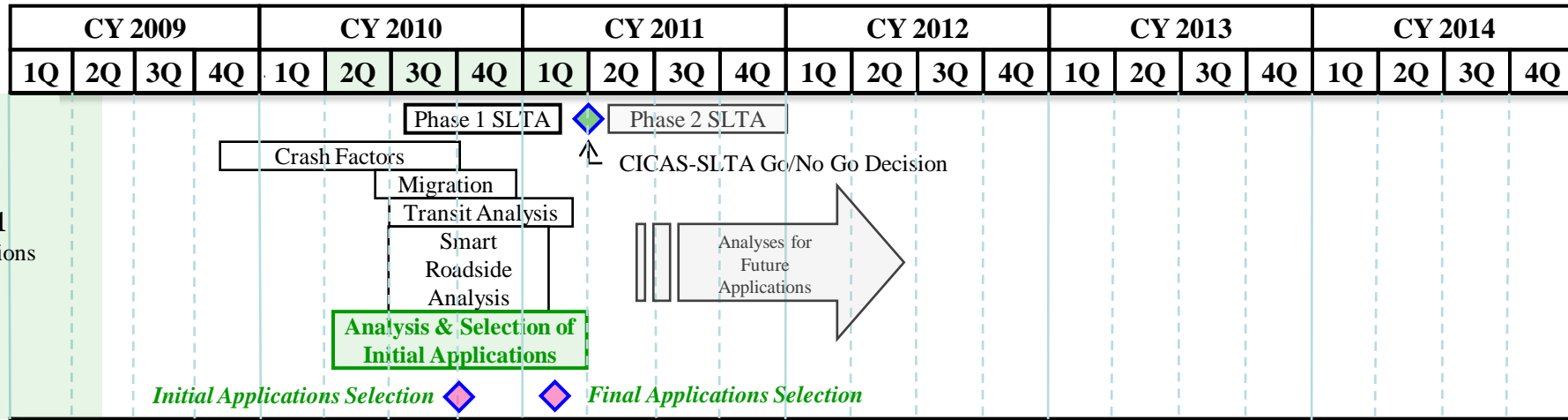
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Multimodal Applications Analyses:

- Crash Factors Study – What crash types can V2I reduce or mitigate?
- Migration Study – What do we have that can be moved to V2I?
- Transit Analysis – What about transit issues?
- Smart Roadside Analysis – What is the status of the Smart Roadside Infrastructure for Commercial Vehicle Operations?

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Analysis and Selection of Applications:

- An iterative process among the US DOT and Stakeholders.
 - Formula to be developed by FHWA
- ◆ Stakeholder Engagement Opportunity – Develop an initial list of potential applications for early implementation.
- ◆ Stakeholder Engagement Opportunity – Selection of V2I safety applications that show the most promise of having a positive cost/benefit ratio for deployment.

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	CY 2009				CY 2010				CY 2011				CY 2012				CY 2013				CY 2014			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Track 2 Prototype Development									Smart Roadside ConOps & Apps Prototype															
									Transit ConOps															
								Safety ConOps				Prototype Applications				◆ FOT Selections								
								◆ ConOps Review				◆ Requirements Review												

TRACK 2 – Prototype Development

Key objective: Develop and validate prototypes of high value cooperative safety applications that will be field tested in Track 4.

Major outputs: Prototype applications ready for integration with infrastructure components and the vehicle components.

Items to be covered:

- Multimodal Concepts of Operations
- Development of Prototype Applications

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CY 2009				CY 2010				CY 2011				CY 2012				CY 2013				CY 2014			
1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Track 2 Prototype Development								Smart Roadside ConOps & Apps Prototype															
								Transit ConOps															
				Safety ConOps				Prototype Applications				◆ FOT Selections											
				ConOps Review ◆				◆ Requirements Review															

Concept of Operations:

- Develop Smart Roadside and Transit Concepts of Operations.
- Develop Safety Concept of Operations.
- ◆ Stakeholder Engagement Opportunity – Review of Initial Safety Concept of Operations.

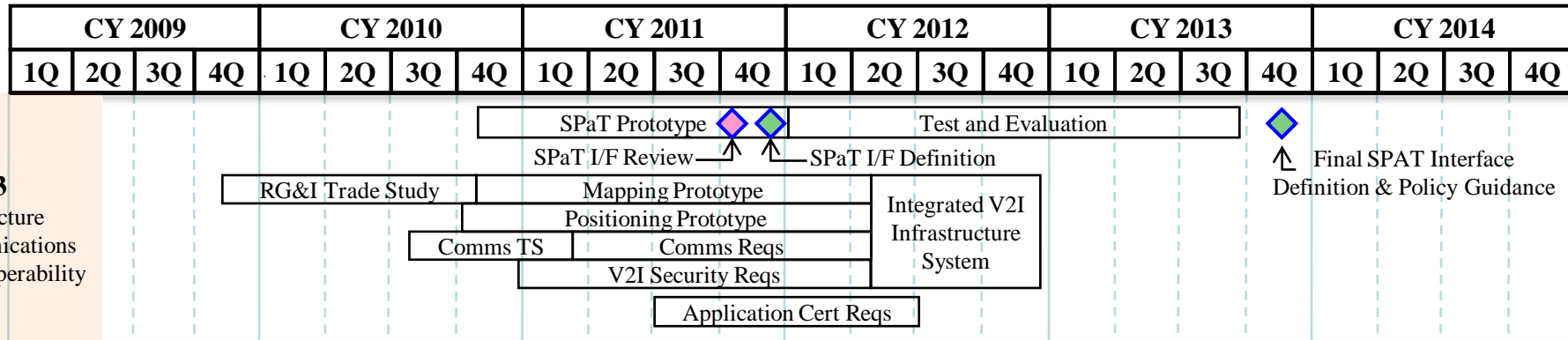
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Track 2 Prototype Development								Smart Roadside ConOps & Apps Prototype															
								Transit ConOps															
								Safety ConOps				Prototype Applications				FOT Selections							
								ConOps Review				Requirements Review											

Development of Prototype Safety Applications:

- ◆ Stakeholder Engagement Opportunity – Prototype Applications Requirements Review and Input
- ◆ Selection of Applications for Field Operational Tests

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Track 3
Infrastructure
Communications
& Interoperability

TRACK 3 – Infrastructure Communications & Interoperability

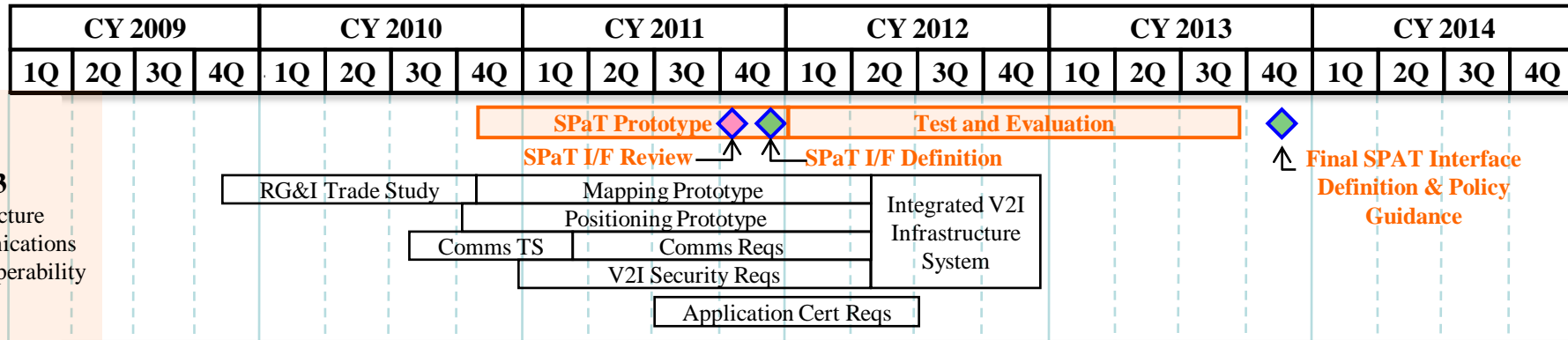
Key objective: Provide the critical technology underpinnings that allow safety applications to be deployed nationally.

Major outputs: Integrated V2I Infrastructure System needed for exchange of useful data and information.

Items to be covered:

- Definition of SPaT Interface and Policy Guidance
- Infrastructure Systems Interoperability and Communications
- Integrated V2I Infrastructure System (Reference Implementation)
- Applications Certification Requirements

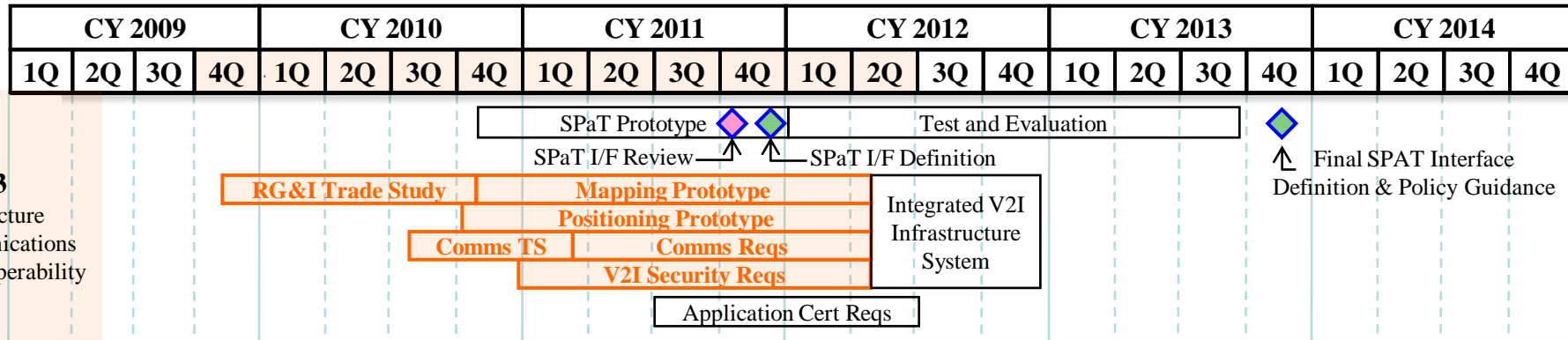
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Definition of SPaT Interface and Policy Guidance:

- Develop SPaT Prototype
 - ◆ Stakeholder Engagement Opportunity – Review initial concept for SPaT Interface
 - ◆ Initial definition of SPaT Interface
- Test and Evaluation of SPaT Prototype
 - ◆ Final SPaT Interface Definition & Policy Guidance

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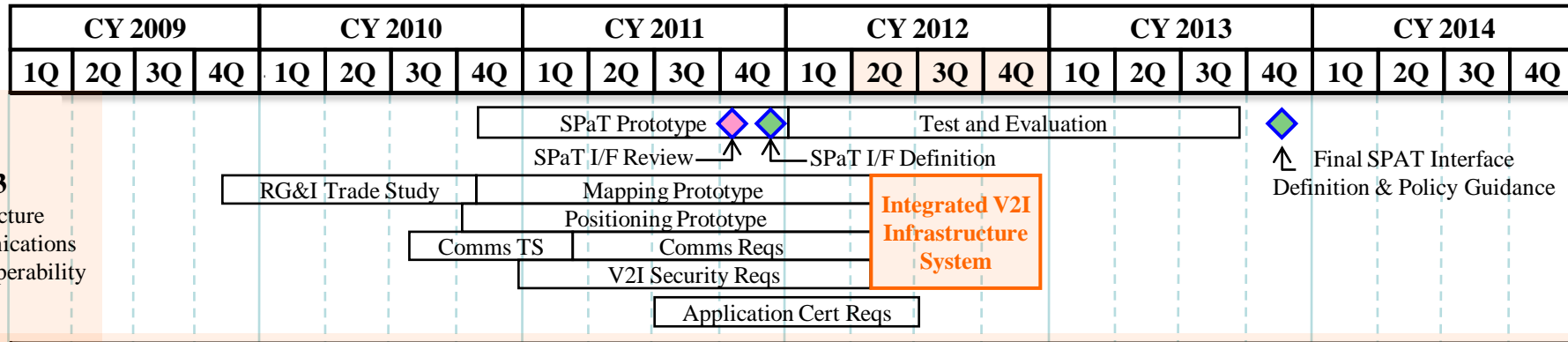


Track 3
Infrastructure
Communications
& Interoperability

Infrastructure Systems Interoperability and Communications:

- Roadway Geometry and Inventory (RG&I) Trade Study.
- Geometric Roadway Map (Mapping) Prototype.
- Positioning Prototype.
- Communications Trade Study.
- Communications Requirements.
- V2I Security Requirements.

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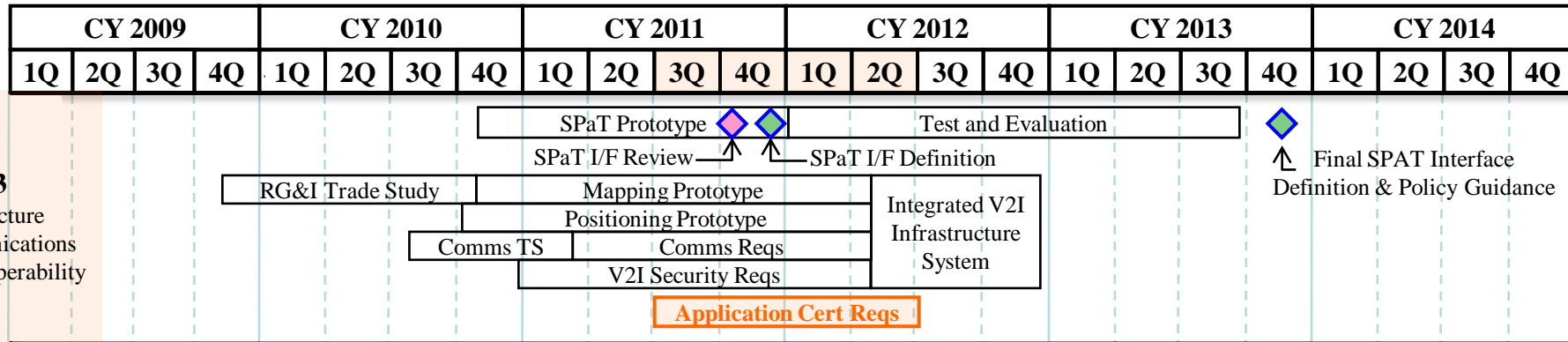


Track 3
Infrastructure
Communications
& Interoperability

Integrated V2I Infrastructure System (Reference Implementation):

- Integration of system requirements.
 - Consolidate outputs from SPaT, positioning, mapping, communications and security.
 - Produce format to enable applications.
 - Serve as “reference implementation.”

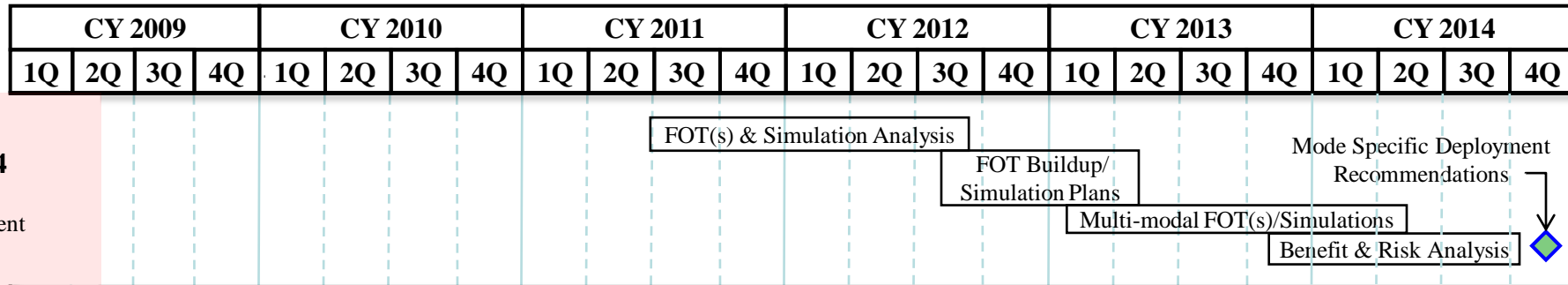
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Applications Certification Requirements:

- Ensure applications meet requirements of IntelliDriveSM Program.
- A systems approach to certification of applications.
- This is NOT an equipment certification process.

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TRACK 4 – Benefits Assessments

Key objective: Conduct field operational tests and simulations.

Major outputs: Reports covering cost-benefit analyses and the associated potential risks for deployment of V2I safety applications.

Items to be covered:

- Prototype Application Evaluations
- Benefit & Risk Analyses

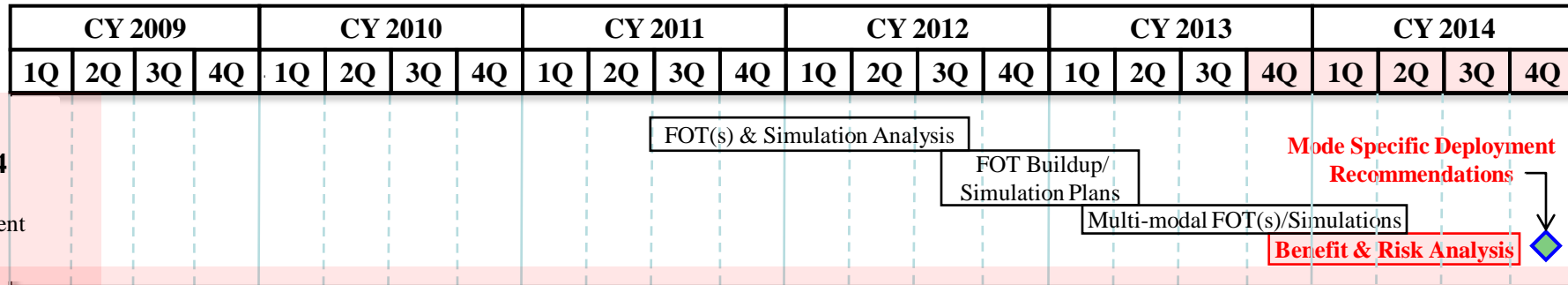
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Track 4 Benefits Assessment								FOT(s) & Simulation Analysis												Mode Specific Deployment Recommendations			
												FOT Buildup/ Simulation Plans				Multi-modal FOT(s)/Simulations				Benefit & Risk Analysis			

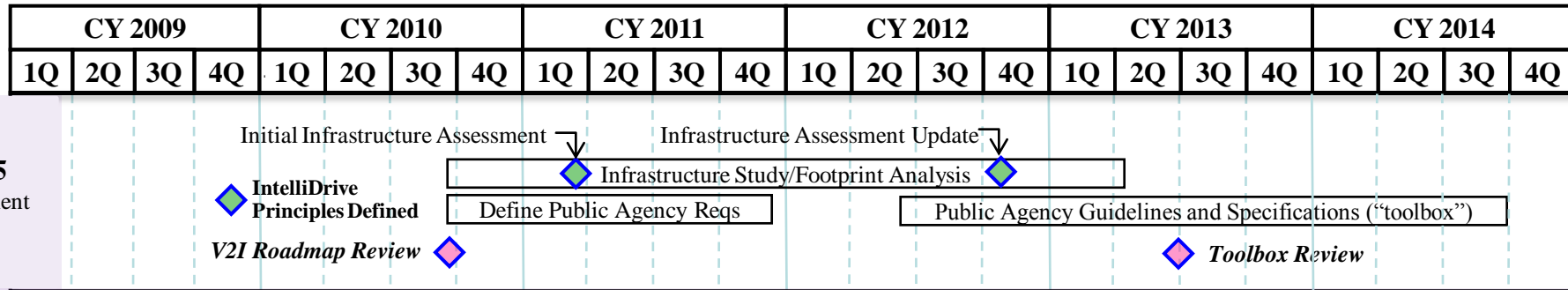
Prototype Applications Evaluations:

- Field Operational Tests (FOT) & Simulation Analysis.
- Field Operational Tests (FOT) & Simulation Planning and Build-up.
- Conduct Multi-modal Field Operational Tests (FOT) & Simulations.

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TRACK 5 – Deployment Planning

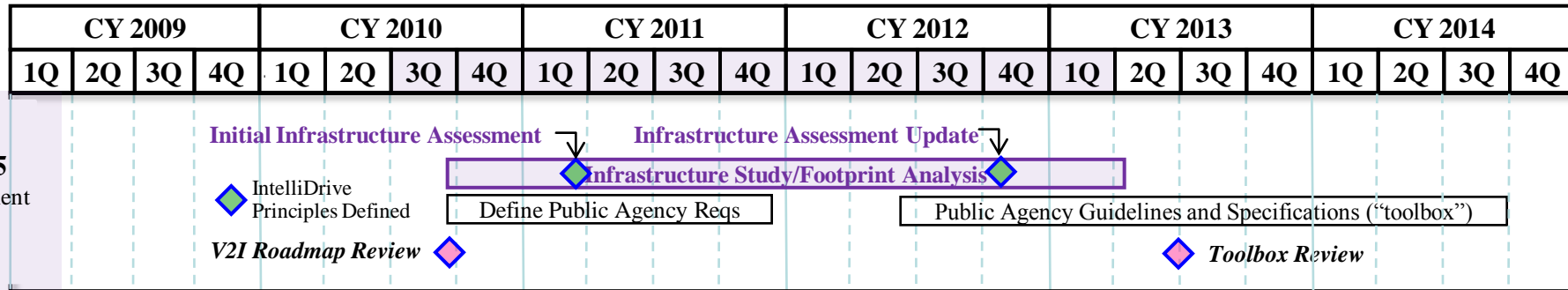
Key objective: Develop tools and guidelines that will aid practitioners in making sound decisions on how to plan, deploy, operate, and maintain V2I systems.

Major outputs: Public Agency Guidelines and Specifications (“Toolbox”)

Items to be covered:

- Infrastructure Study / Footprint Analysis
- Definition of Public Agency Requirements
- Development of Public Agency Guidelines and Specifications – Toolbox

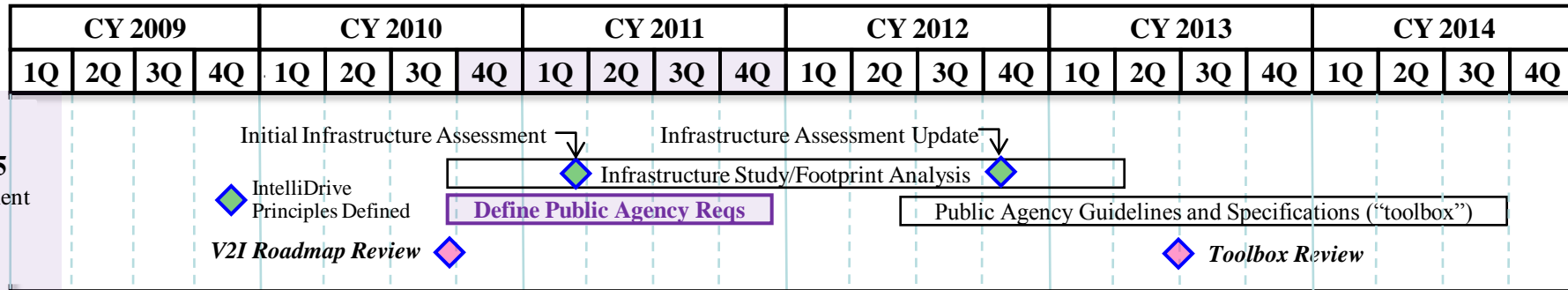
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Infrastructure Study / Footprint Analysis:

- Iterative study that will assess the infrastructure requirements to enable successful deployment of IntelliDriveSM safety applications.
- ◆ Major Milestone – Initial Infrastructure Assessment
- ◆ Major Milestone – Infrastructure Assessment Update

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Define Public Agency Requirements:

- Determine what practitioners need to make an IntelliDriveSM deployment decision.
- Define the requirements that satisfy those needs.

Breakout Questions

1. Are the **research activities** adequate to achieve our objective in each track?
2. Do you foresee any **technical issues** that may pose a challenge in order to get the work done?
3. Do you foresee any **policy issues** that may pose a challenge in order to get the work done?