IntelliDrive[SM] Policy and Institutional Issues Research Plan

Draft

Version 8, December 2009

1.0 BACKGROUND

IntelliDrive[SM]--formerly known as Vehicle Infrastructure Integration (VII)--has the potential to transform travel as we know it. IntelliDrive[SM] combines wireless communications with leading edge technologies such as on-board vehicle computer processing, advanced vehicle-sensors, GPS navigation, smart infrastructure, and others to:

- Identify threats and hazards on the roadway.
- Communicate, clearly and intuitively, this information over wireless networks with near real-time transmission that:
    - Presents alerts, advice, and warnings to drivers and roadway users of the events, potential threats, and imminent hazards within the vehicle's environment;
    - Informs system operators of roadway conditions on all modes, all roads, all of the time; and
    - Delivers higher quality, more ubiquitous data to support mobility applications for travelers and decision support tools for system operators.

The foundation of IntelliDrive[SM] is a networked environment supporting very high speed transactions among vehicles (V2V) and between vehicles and infrastructure components (V2I) or hand-held devices (V2D) to enable numerous safety, mobility, and environmental applications. This capability to identify, collect, process, exchange, and transmit real-time data will provide both drivers and system operators with a greater *situational awareness* of the transportation environment and is expected to result in:

- Drivers being able to make better and safer decisions while driving;
- When further combined with automated vehicle safety applications, vehicles having the ability to respond and react when the driver can't or doesn't in time, significantly increasing the effectiveness of crash prevention and mitigation applications;
- System operators, vehicle operators, and travelers having the necessary information for dynamic decision making on mobility, route efficiency, cost of transportation, environmental impacts and mitigation strategies, and the secure and efficient movement of people and goods; and
- A rich foundation for business developers to create innovative and visionary applications for the breadth of potential users.

2.0 CONCEPT

IntelliDrive[SM] is a transformative concept. The goal of the program is to achieve a safer and smarter transportation system through a fully connected driving environment that can deliver the safety, mobility, and other benefits made possible through a wireless networked environment.

To achieve effective deployment of IntelliDrive[SM], new policy and, potentially, regulatory requirements will be needed to establish the institutional foundations, catalyze deployment and markets, and manage risks. This plan is describes the research and analysis needed to develop options and how key partners and industry will contribute to the development of actions and recommendations that will move the IntelliDrive[SM] research and deployment forward.

3.0 RESEARCH PLAN VISION

The IntelliDrive[SM] program is a joint public-private program that is supported by a coalition that was formed to research and determine the feasibility of widespread deployment. The coalition consists of the U.S. Department of Transportation (US DOT), light vehicle manufacturers, state and local governments, and their representative associations.[1] This coalition is further supported by input from other industries, other advocates and stakeholders, and the public through regular working groups and web and virtual communications and exchanges.

The vision for an *IntelliDrive[SM] Policy and Institutional Issues Research Plan* is one of a collaborative effort among these partners to structure and conduct a research agenda that enables successful deployment of IntelliDrive[SM] for the Nation. Additionally, the plan coordinates the policy and institutional research with other stakeholder-based IntelliDrive[SM] research activities.

It should be noted that the ultimate outcome of this plan and its associated activities is a set of recommendations that are agreed upon by the majority of IntelliDrive[SM] stakeholders. It is not meant to design or prove the viability of a specific policy position or statement.

4.0 RESEARCH PLAN GOAL

The goal of this plan is to structure a comprehensive research agenda that:

- Enables a successful and sustainable deployment of IntelliDrive[SM];
- Addresses institutional issues; and
- Provides options for a policy foundation.

The outcome of this research plan is threefold:

- Research and analysis that produces a *range of viable options* for policies, legislative/regulatory options, governance structures, investment models, market forces, and resolutions to institutional issues related to IntelliDrive[SM].
- The combination of the options with *basic deployment scenarios* to illustrate a set of alternative, viable, more richly detailed deployment scenarios for IntelliDrive[SM].
- The development of *concepts and recommendations* that will be presented for discussion.

5.0 RESEARCH PLAN OBJECTIVES

The objectives are to develop a plan that:

- Identifies, incorporates, and builds from existing transportation research and development activities that are being performed by the US DOT and others.
- Identifies the gaps and describes new and needed research.

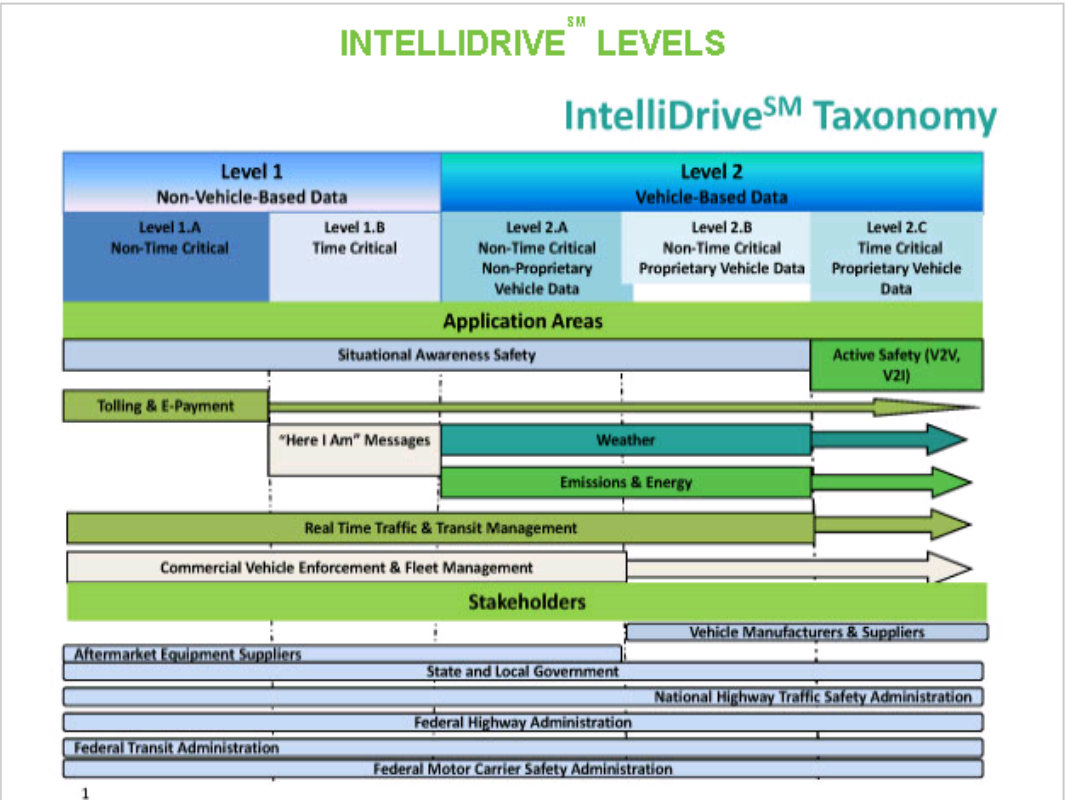
[1] For more on the coalition, see http://www.intellidriveusa.org/coalition/.

- Develops a set of alternative scenarios that:
    a. Describe a range of appropriate policy and institutional foundations for IntelliDrive[SM] deployment;
    b. Identify ways to stimulate the market that will sustain IntelliDrive[SM] in the future;
    c. Foster collaboration among public, private, and other partners.

6.0 RESEARCH PLAN ASSUMPTIONS

A key assumption in moving the IntelliDrive[SM] policy and institutional issues research forward is that the new work will build from previous research and efforts under the VII program.

Another key assumption is that the policy and institutional issues research will build from the IntelliDrive[SM] Taxonomy[2], a definition of how IntelliDrive[SM] can use different communication technologies to deliver different levels of applications. These levels begin with Level 1a, which is defined by an open architecture that allows for a wide range of communications devices and connectivity and data to deliver IntelliDrive[SM] benefits that are mostly focused on mobility and congestion data. At the opposite end of the range is Level 2c, which is based on a highly configured architecture that can deliver active safety (as well as the range of other applications) through the use of dedicated short-range communications (DSRC), strict protocols for security, access, and certification, and a stronger governance and oversight option. This taxonomy is illustrated below and is referenced throughout this document.



[2] Graphic illustration and definitions can be found at: http://www.intellidriveusa.org/research/research-activities.php.

7.0 RESEARCH PLAN

7.1 Overview

To date, research on the policy and institutional issues that need to be addressed to facilitate successful deployment of IntelliDrive[SM] has been conducted and can be described as follows[3]:

- Research that sought to develop policies and address institutional issues *consistent with an initial system architecture concept*, known as the VII architecture.
- Research that identifies and describes alternative policies or alternative means for addressing institutional issues but *does not present analysis of the alternatives or recommend a specific path toward deployment*.

Since 2004, the ITS Program and its partners (modal, industry, and academia) have achieved important progress in developing, prototyping, and testing an IntelliDrive[SM] infrastructure, vehicles, and applications. As a result, the timing is critical for developing a research agenda that will complete the work necessary for establishing the appropriate policies and addressing institutional issues for successful IntelliDrive[SM] deployment.

One common element throughout the majority of work to date is the starting point for analysis. Typically, analysis has begun with the description of the IntelliDrive[SM] system architecture--its composition in terms of wireless communications, roadside infrastructure, on-board equipment, and applications--otherwise referred to as a *deployment scenario*. In most of the previous work, this architecture was based on an initial architecture concept that was predominantly focused on vehicle-to-infrastructure (V2I) but also included vehicle-to-vehicle (V2V) deployment using embedded vehicle devices.

In recent years, evolution of technology has added a third dimension--vehicle-to-device (V2D)—with the recognition that new and more highly evolved devices within the marketplace, such as cell phones with GPS components, could provide opportunities for connectivity that were not included in the initial VII vision.

Research conducted from 2002-2008 identified preliminary definitions of some of the key elements in a policy and institutional foundation: (a) governance structures, (b) business and investment models, (c) implementation and operations strategies, and (d) discussion of legislative, institutional, and societal issues. This previous research also identified many of the critical questions that remain to be fully analyzed.

The following document is a plan for completing the analysis needed to move the IntelliDrive[SM] policy and institutional agenda forward. The plan is focused on two major efforts:

- Exploring the answers to a set of initial, critical questions.

[3] Definitions of "classic VII" and IntelliDrive[SM], and the evolutionary path taken to reach the current state of IntelliDrive[SM], can be found in numerous sources including *ITS Research Results: 2008 ITS Program Plan*, the website *www.intellidrive.org*, and the recently released white paper "*Synthesis of Intellidrive[SM] Business Model RFI Responses*."

- Conducting a broader and deeper analysis that results in the type of knowledge sought by the key stakeholders for supporting and achieving successful IntelliDrive[SM] deployment.

The structure of the plan is similar to the previous work in that the first track starts with the description of what IntelliDrive[SM] might consist of; in other words, a set of system descriptions or *deployment scenarios*. Development of these deployment scenarios comprises the first track for research. Using these deployment scenarios, the remaining research is divided into:

(a) *Four additional research tracks* that represent the major activities that are required to develop a set of alternative scenarios for consideration with stakeholders; and

(b) *A fifth track* that compares the alternative scenarios for strengths, weaknesses, opportunities, and risks; analyzes the trade-offs; and develops recommendations on a path or set of paths intended to result in a robust policy and institutional foundation for IntelliDrive[SM] deployment.

Roadmaps are presented throughout the remainder of this document to illustrate the task activities that are specific to this *Policy and Institutional Issues Plan and Roadmap*.

7.2 Track 1—Development of Deployment Scenarios and Implementation Strategies

Objective: The objective of the first track is to describe, in partnership with stakeholders, a set of potential deployment scenarios and implementation strategies that, through further analysis, will eventually provide options for IntelliDrive[SM] deployment. The deployment scenarios will be described through a set of key characteristics, including: technical architecture, applications, and implementation and operational strategies.[4] The deployment scenarios will also form the basis for conducting research in the remaining tracks.

Expected Outcome: A set of deployment scenarios that will be the basis for research in the remaining tracks. Each deployment scenario will include:

1. A technical architecture configuration.
2. A defined set of applications that are enabled by the architecture.
3. A set strategies that would be required for successful implementation and operations, with the identification appropriate roles and responsibilities.
4. The definition of the types of guidance materials, policies, and decision support tools that will support successful implementation and operations.

Proposed Tasks to Achieve Outcome: Figure 1 on the following page illustrates the tasks for Track 1 that will incrementally and comprehensively define deployment scenarios and implementation strategies over time. The following text defines each task.

1.1. **Definition of the IntelliDrive[SM] Program and Goals:**

Task 1.1: Develop and circulate a set of *IntelliDrive[SM] Principles and Taxonomy* for review, comment, and consensus.

Task 1.1: Review of this document for industry comment and agreement.

1.2. **Develop Research Plan and Roadmap:**

Task 1.2: Develop the *IntelliDrive[SM] Policy and Institutional Issues Research Plan and Roadmap* (this document).

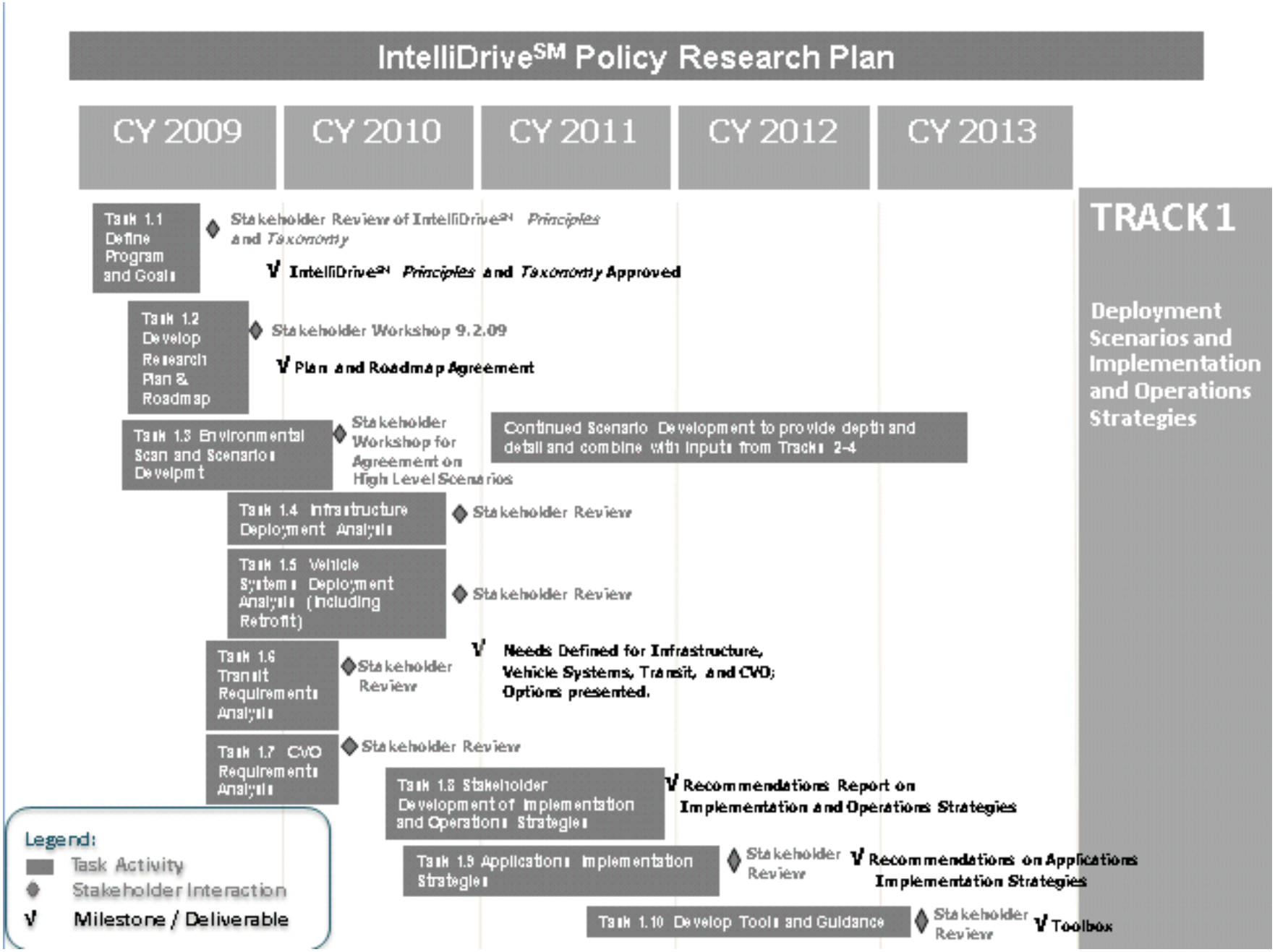
Task 1.2: Conduct a ***Public Workshop*** in September 2009 to review and validate the IntelliDrive[SM] Policy and Institutional Issues Roadmap with stakeholders.

Milestone: *IntelliDrive[SM] Principles and Taxonomy* approved.

Milestone: Agreement among stakeholders on the *IntelliDrive[SM] Policy and Institutional Research Plan and Roadmap.*

[4] Implementation and operational strategies include the types of guidance and tools needed to ensure the successful technical, organizational, and physical (installation/maintenance) deployment of IntelliDrive[SM]; and the types of strategies that support successful ongoing operations.

Figure 1: IntelliDrive[SM] Policy and Institutional Issues Research Roadmap
(File: Research Timeline v.8,12.01.09)



1.3. **Development of Initial Deployment Scenarios:** Using input from the workshop and the Concept of Operations (developed under the technical roadmaps), this task will continue with in-depth analysis to deliver fuller, more comprehensive technical deployment scenarios that, when drafted, reviewed, and agreed upon by key stakeholders, can then be married to the various options for financing/investment models (track 2), governance frameworks (track 3), and legislative and institutional options (track 4). Task 3 includes three reports and stakeholder reviews:

Task 1.3: **Environmental Scan:** Conduct research and interviews to determine what trends may be emerging across a wide spectrum of relevant domain to identify concerns and understand system-wide deployment possibilities. A broad understanding of trends will help ensure that the political, social, economic, technological, cultural, and policy issues that may affect a successful IntelliDrive[SM] deployment are well understood.

Task 1.3: **Initial Deployment Scenarios:** Define, at a high level, specific characteristics of a set of deployment scenarios in cooperation with stakeholders and based on the use of the IntelliDrive[SM] taxonomy. Using the taxonomy levels, define key characteristics for what a deployment scenario might include at each level:

- Architecture and Applications—definition of what applications are possible with each architecture approach. *Minimum* stakeholder engagement in this analysis includes:
  - NHTSA—to analyze applications that can be done with V2V.
  - AASHTO and others—to understand the critical public sector applications, what data is needed, how data can be obtained, and implications for deployment.
  - Automotive industry and private sector—to understand implications for deployment and market development and sustainability.
  - Transit and CVO industry—to understand requirements that may differ from light vehicles and/or be specific to the mode.
- Infrastructure analysis
- Vehicle Systems deployment analysis (including a retrofit option)
- Basic cost estimation.
- Basic benefit estimation.
- Basic market assumptions and roles and responsibilities.
- Analysis of technology readiness (track results to technical V2V and V2I roadmaps).

Task 1.3: **Initial Deployment Scenarios Workshop:** Hold a stakeholder review workshop to receive input and feedback on the initial deployment scenarios. Workshop scheduled for late winter / spring 2010.

1.4. **Infrastructure Deployment Analysis**

Task 1.4: **Infrastructure Deployment Analysis:** Work with public sector partners to identify needs and challenges associated with installing, operating, and maintaining IntelliDrive[SM]. In part, the analysis will be based on answering a

key question for IntelliDrive[SM]: *what is the minimum amount of infrastructure needed to provide maximum benefit?*

1.5. **Vehicle Systems Deployment Analysis**

Task 1.5: **Vehicle Systems Deployment Analysis (including retrofit strategy):** Work with private sector partners to identify the technical needs and challenges with successful deployment. Analyze the opportunities and problems associated with the aftermarket versus retrofit versus embedded technology approach. Similar to the infrastructure analysis, the vehicle systems deployment analysis needs to address the question: *what is the minimum amount of infrastructure needed, if any at all, to provide maximum benefit?*

1.6. **Transit Specific Requirements:**

Task 1.6: Develop an understanding of the needs of the transit industry—agencies and vendors—for incorporating transit into IntelliDrive[SM].

Task 1.6: Analyze transit opportunities by IntelliDrive[SM] taxonomy levels to ensure that early successes are identified and adopted, and that the most cost-effective communications and technologies are applied to transit needs.

Task 1.6: Conduct outreach to engage the transit industry stakeholders in the development of IntelliDrive[SM] deployment scenarios and strategies.

1.7. **Commercial Vehicle Operations[5] Specific Requirements:**

Task 1.7: Develop an understanding of the needs of the commercial vehicle operations (CVO) industry—States, trucking companies, trucking associations, and vendors—for incorporating CVO into IntelliDrive[SM].

Task 1.7: Analyze commercial vehicle and fleet opportunities by IntelliDrive[SM] taxonomy levels to ensure that early successes are identified and adopted, and that the most cost-effective communications and technologies are applied to commercial vehicle and fleet needs.

Task 1.7: Conduct outreach to engage the CVO industry stakeholders in the development of IntelliDrive[SM] deployment scenarios and strategies.

Milestone: Needs Definition for Infrastructure, Vehicle Systems, Transit, and CVO. Options presented.

Milestone: Stakeholder agreement on potential scenarios that can be further defined through work in Tracks 2-4.

1.8. **Implementation Strategies Development:**

Task 1.8: Based on the needs identified in tasks 1.2-1.7, work with stakeholders to develop a range of implementation and operations strategies in combination with each deployment scenario by:

[5] Commercial Vehicle Operations is defined to include both the operations and mobility (freight) aspects as well as the safety aspects of commercial vehicles. Additionally, CVO encompasses both heavy vehicles (trucks) as well as in-service motor coaches.

- Engaging AASHTO and other public sector stakeholders (including transit and CVO) to identify infrastructure deployment strategies and to identify State and local agency needs.
- Engaging with VIIC to identify vehicle-based deployment strategies.
- Exploring the adoption and growth of other system technologies and develop consumer adoption and growth models and lessons learned.
- Identifying the advantages and disadvantages of each.

Milestone: Recommendations Report on Implementation and Operations Strategies

1.9. **Applications Analysis and Implementation Strategies:**

Task 1.9: Identify and make recommendations for addressing institutional issues that may be associated with launching various applications. For instance, this may include work with the MUTCD on issues associated with messages versus signs. Another research area may be legislative issues and requirements regarding new safety applications.

Task 1.9: Provide for stakeholder review.

Milestone: Recommendations on Applications Implementation Strategies

1.10. **Tools and Guidance:**

Task 1.10: Using the work from Tasks 1.2-1.9, develop a toolbox of useful materials in support of successful deployment. It is anticipated that tools may include: policies, reference guides, training, workshops, presentations to decision makers, and other materials.

Task 1.10: Provide for stakeholder review.

Milestone: Toolbox

Summary of Key Milestones:

- Program Definition and Goals Defined
  - Transit and CVO requirements defined
- Research Plan and Roadmap Agreement and Public Workshop
- Stakeholder Agreement that there is a set of different, feasible paths to deployment and that these paths (or scenarios) are the basis for further research and analysis, as described in the remainder of this plan.
- Needs and Issues analyzed through a variety of reports. Options presented.
- Recommendations on Deployment, Operations, and Applications Implementation Strategies.
- Toolbox.

Relationship to Other Research: The development of a set of potential deployment scenarios sets the stage to launch further policy and institutional research and analysis activities. Development of deployment scenarios also help answer questions about the need for IntelliDrive[SM] infrastructure, which assists in setting the requirements for further technical research (for instance, around the signal phase and timing (SPAT) element or around the intersection collision avoidance applications).

7.3 Track 2 –Understanding Market Factors and Identifying Alternative Investment Models

Objective: The objective of this track is to understand the implementation options for each deployment scenario from a financial, business, and market perspective.

Expected Outcome: Research that results in:

1. An analysis of the market factors for each deployment scenario that identifies:
   - Funding and investment sources for deployment.
   - Financial incentives for seeding and sustaining a market.
   - Revenue streams.
   - Costs and expenses associated with deployment and operations.
   - Partnership opportunities.
   - Market sustainability factors
   - Roles and Responsibilities
2. A set of alternative investment models.

Proposed Tasks to Achieve Outcome: Figure 2 on the next page provides the roadmap for this track. Tasks included are:

2.1 Develop Needs Summary White Paper:

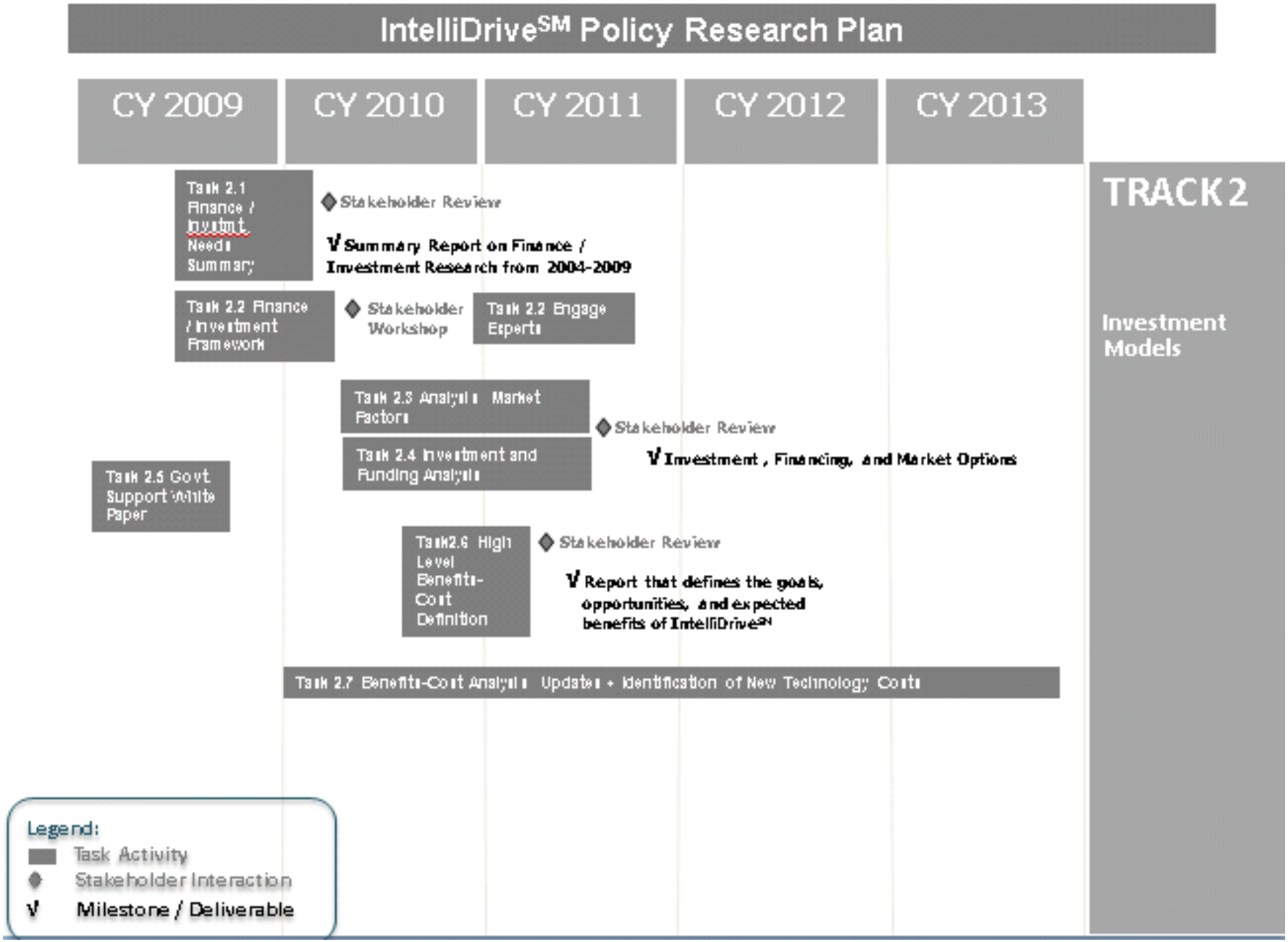
Task 2.1 Develop a summary paper that summarizes past research from 2004-2009 on the topics of investment, financing, partnerships, business models, market assessment, and others. As this particular area of research uses basic terms that have different meaning in different sectors, the paper will offer basic definitions. The paper's format will be similar to summary white papers for the Governance Track (3) and the Institutional Issues Track (4). The white paper format begins with a basic set of working definitions to ensure that stakeholders can understand and embrace the same concepts. After summarizing the research from the past, the white paper presents a synthesis, asking *what is known/ understood because of this past research?*, identifies the gaps and information that is still missing, and sets a near-term agenda for further research and deliverables.

Milestone: Summary report on Investment, Finance, Market Assessment Needs

2.2 Develop A Framework for Investment/Finance/Market Issues

Task 2.2 Engage stakeholders in identifying key issues and opportunities in this area. Use input to develop a framework that both allows the issues to be parsed and assessed, and allows experts to further explore and analyze the opportunities. The framework is expected to use the IntelliDrive[SM] taxonomy levels and identify market investment opportunities, opportunities where public funding might seed or incentive a market, market areas where public financing (and which type) is the only available option, and potential market synergies.

Figure 2: IntelliDrive[SM] Policy and Institutional Issues Research Roadmap
(File: Research Timeline v.8,12.01.09)



Task 2.2 Develop a workshop to engage stakeholders and the public on the framework: The workshop will explore the sources of funding available for IntelliDrive[SM] deployment, operations, and maintenance. In the workshop, a key goal is to identify the options for private sector versus public sector roles and to identify what further research in this area is needed.

Task 2.2: Develop a strategy to engage experts to validate the framework and its assumptions, and identify the appropriate areas for further, in-depth research. Experts will include those from the venture capital, equity, and other types of market financing, experts in corporate strategic investments who understand leverage opportunities, and experts in more traditional innovative financing and public-private partnerships (PPP) for transportation, including experts from highways, transit, freight, motor carriers, and others to identify how they have used innovative mechanisms in the past and their successes or lessons learned that may be applicable to IntelliDrive[SM].

Task 2.2: Develop a set of proceedings from the workshop. Use these proceedings to better define the approach for tasks 2.3 and 2.4.

Milestone: An agreed upon framework that identifies areas for further analysis

2.3 Market Factors Analysis:

Task 2.3: Using the results of the environmental scan (task 1.3) and the framework from task 2.2, conduct an analysis to articulate, with specificity, how market factors will drive or influence the success of IntelliDrive[SM]. This analysis will also identify the factors that create a sustainable and ongoing marketplace.

2.4 Investment and Funding Analysis:

Task 2.4: Conduct an analysis to develop a set of alternative investment models with a description of how each model will work and the potential impact of each model on the market environment. Analysis will also identify funding sources, building from the insights gain in the workshops in Task 2.2.

Milestone: Investment, Financing, and Market Options

2.5 Government Authority and Role White Paper:

Task 2.5: Building from the *White Paper on Public Sector Support*, which defines the government role and authority for supporting IntelliDrive[SM] deployment, Task 2.5 will produce an additional white paper that identifies examples on how various incentive programs and tools have been used successfully by other government agencies, and document case studies where relevant to IntelliDrive[SM]. These will include, but are not limited to, a qualitative and (where possible) quantitative analysis of tax credits, government seed funding of a market, grants, regulations (will build from analysis under track 3 on governance models), and PPPs.

2.6 High Level Benefits-Cost Report:

Task 2.6: Develop a 10-page report that documents the facts and benefits of an IntelliDrive[SM] system that can be used with high-level decision makers and the public.

Task 2.6: Provide stakeholder review.

Milestone: Report that defines the goals, opportunities, and expected benefits of IntelliDrive℠

2.7 Expand the Benefits-Costs Analysis (BCA) database:

Task 2.7: With completion of the initial deployment scenarios (and agreement by stakeholders), update and include additional costs identified within the deployment scenarios and identify new or additional benefits.

Task 2.7: Identify costs of new technologies, which will need to include the engagement of expert marketers and technologists to provide grounded, realistic estimates for forecasting and modeling.

→ With the completion of Task 2 efforts, each deployment scenario will be combined with an appropriate investment/financing option and the advantages and disadvantages identified.

Summary of Key Milestones:

- Workshops with experts on capital markets, strategic investments, innovative financing, and PPP that will result in a set of proceedings, definitions, and a more detailed understanding of how to proceed under tasks 2.3 and 2.4.
- High-level benefits-cost report
- Market, Financial, and Investment recommendations
- Stakeholder workshops and other interactions.

7.4 Track 3 –Development of Governance Structures

Objective: The objective of this track is to understand the implementation options for each deployment scenario from a governance perspective, including legislative and regulatory requirements, institutional authority, basis for enforcement and procedures, the role of stakeholders, and the role of standards.

Expected Outcome: Research that addresses the governance structure options for each deployment scenario:

1. Background research that explores the elements of governance and develops options for:
    - Enterprise Governance:
        - Granting of authority – *who will govern? What is the appropriate and most effective means for granting authority to govern the IntelliDrive[SM] system?*
        - Roles and responsibilities of authorities and stakeholders
        - Development of decision making processes, charters, legislation (if needed)
        - Development of processes for solving conflicts among stakeholders
    - System Governance:
        - Development & Deployment:
            - Analysis on how different **deployment scenarios** will generate different governance frameworks and different needs
            - Analysis on how different **applications** may require different levels of governance and message prioritization based on different needs
            - Analysis on how different **entities** may require different levels of governance.
            - Analysis on how the opportunities around **private market financing, PPPs**, and **institutional issues** may generate different governance frameworks
            - Standards – with the completion of the standards, the resulting technical requirements, systems engineering, architecture may have an impact on the framework for governance
            - Development of processes for setting and measuring progress toward performance standards; development of performance standards for the system
        - Operations:
            - The development of the form and processes for operating entity structure(s) and day-to-day administration and oversight
            - Definition of operating entity roles and responsibilities
            - Definition of performance standards for functioning equipment
        - Maintenance:
            - Identification of processes for incorporating technology evolution and for keeping standards updated and maintained
            - Identification of procedures for access to technologies deployed in the field to perform upkeep and maintenance
        - Control and Enforcement:
            - Governing Board – definition, charter, parameters
            - Development of rules for enforcement

- Identification of requirements for regional and local control and enforcement, and the jurisdictional and consistency issues
- Determination of the most effective use of market incentives
- Determination of whether use of standards can be voluntary or require regulation, and analysis of impact on the market
- Development of security requirements
- Development of certification requirements for both manufacturers of equipment and for certifying a potentially wide range of technologies
- Development of criteria or standards for recall processes of equipment
- Development of processes for authentication of users / accounts /staff and contractors and Rules for Access to network, equipment, data

- Additionally, focus will be given to legislative or regulatory requirements that might be needed to provide the basis for authority and enforcement; How standards are set and how they support or block market sustainability; and how certification and user authentication of the system will work.

2. A set of alternative governance structures.

Proposed Tasks to Achieve Outcome:

3. 1. **Governance Needs Summary:**

Task 3.1: Develop a concise report on governance needs associated with IntelliDrive[SM]. Summarize needs from existing materials to date and identify key steps in developing a framework.

Milestone: Report on Governance Needs

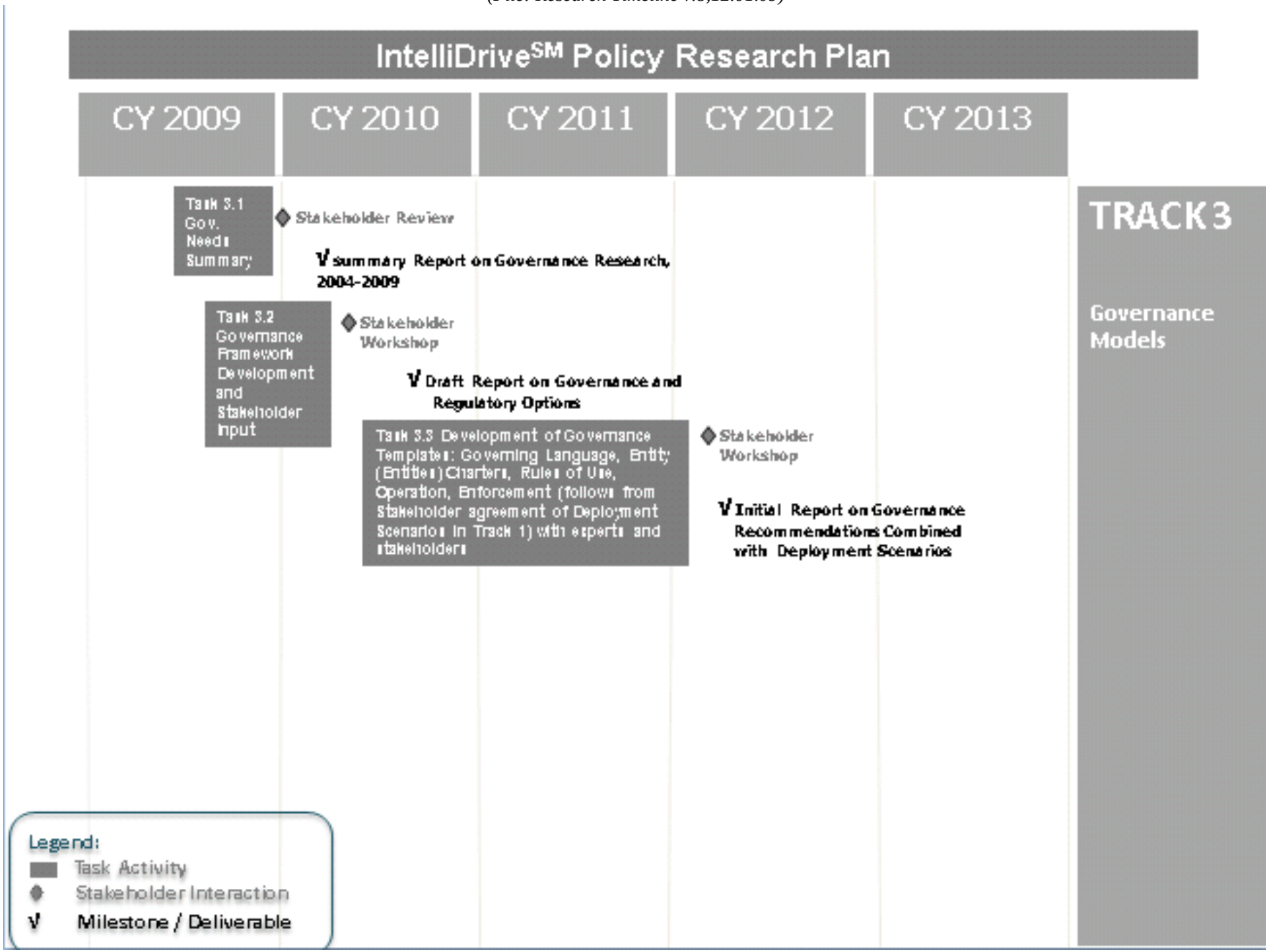
3. 2. **Development of a Governance Framework(s):**

Task 3.2 Engage stakeholders in identifying key issues and opportunities in this area. Identify existing governance models at the State and local levels that are effective. Identify factors in which governance models both catalyze and hinder market development and sustainability. Research other industries to identify and understand their governance frameworks. Review the work of governance experts and identify those experts at the intersection of governance models and technology markets to assist in further research. This task should predominantly answer the following questions:

- *What parts of the IntelliDrive[SM] system need governance and why?*
- *How does governance vary by IntelliDrive[SM] taxonomy level?*
- *What are scenarios under which interaction with applications at one level might affect governance at another level?*

Use input to develop a framework that both allows the issues to be parsed and assessed, and allows experts to further explore and analyze the opportunities. The framework is expected to use the IntelliDrive[SM] taxonomy levels and identify how governance might apply to IntelliDrive[SM]. The analysis will consider an entity's ability to stimulate a market and engage the private industry in delivery of the service; issues concerning safety; use of regulation and its impact; whether each entity has dealt with policy that is similar to the "federated" nature of the transportation system; the success of setting, implementing, enforcing standards; whether standards play a vital role in sustaining the market for the service; and how administrative and management is structured..

Figure 3: IntelliDrive[SM] Policy and Institutional Issues Research Roadmap
(File: Research Timeline v.8,12.01.09)



Task 3.2 Research governance structures of other entities. Entities to research that are likely to have structures somewhat relevant to IntelliDrive[SM] are listed in Appendix B. The criteria for researching the existing governance structures –their frameworks, their opportunities, and their limitations—include the following criteria:

- Significant use of communications technologies, and governance through standards, security, authentication, certification, and access procedures;
- Have a need to track and incorporate evolving technologies;
- Have a strong private sector interest and a dynamic and sustainable marketplace;
- Have a highly diverse set of stakeholders and perspectives

Task 3.2 Develop a workshop to engage stakeholders and the public on the framework: The workshop will explore stakeholder reactions to the framework and further identify important details important to developing appropriate governance structures and documentation.

Task 3.2: Develop a strategy to engage experts to validate the framework and its assumptions, and identify the appropriate areas for further, in-depth research. Experts will include those from academia who have studied governance structures and effects, those from private industry and non-profit organizations who have implemented and participated in governance structures, and those from government who have developed and implemented structures.

Task 3.2: Develop a set of proceedings from the workshop. Use these proceedings to better define the approach for tasks 2.3 and 2.4. Research scope will likely include a full regulatory analysis that identify how different approaches to regulation versus standardization versus market incentives could impact safety and enable or limit market opportunities. Identify if legislation is necessary and, if so, the most effective legislative approach for supporting each alternative deployment scenario.

Milestone: Governance and Regulatory Options Report

3. 3. **Development of Governance Templates and Rules of Use, Operation, and Enforcement:**

Task 3.3: Using the initial deployment scenarios created under Track 1 and using the input from tasks 3.1 and 3.2, develop a set of rules that govern use, operation, and enforcement. Identify how authority is granted. Develop appropriate templates and documents for stakeholders to review.

Task 3.3: Hold a one-day workshop to present on findings and options.

Milestone: Initial Recommendations Report on Rules of Use, Operation, and Enforcement

→ With the completion of Task 3 efforts, each deployment scenario will be combined with an appropriate governance structure and the advantages and disadvantages identified. As the deployment scenarios will have been combined with an appropriate investment option, the governance structure will need to accommodate and enable the proposed investment option.

Summary of Key Milestones:

- Report on Governance Needs

- Report on initial Governance and Regulatory Options
- Structured Recommendations on Governance and Regulatory Options
- Stakeholder Workshops

7.5 Track 4—Identification of Institutional Issues and Roadblocks

Objective: The objective of this track is to identify the institutional issues, challenges, and roadblocks associated with each deployment scenario and identify options for resolving them.

Expected Outcome: An identification of and set of recommendations for resolving the issues, roadblocks, and challenges associated with each deployment scenario.

Proposed Tasks to Achieve Outcome:

4.1. **Develop a Needs Summary White Paper for Institutional Issues**

Task 4.1: Similar to the summary papers for tracks 2 and 3, develop a white paper summarizing the institutional issues understanding based on the VII research.

4.2. **Institutional Issues Analysis**

Task 4.2: Conduct research and analysis on the critical questions listed above. For each deployment scenario, develop an understanding of and recommendations for:

- Privacy issues
- Liability issues
- Patent or IP issues
- Data ownership issues
- Spectrum issues
- State and Local funding issues

4.3. **Legislative Analysis:**

Task 4.3: Conduct a legislative analysis to:

- Identify whether existing Federal, State, and local legislation may conflict with or offer best practices for IntelliDrive[SM] deployment.
- Identify and analyze cross-jurisdictional issues and other impacts.

4.4. **Risk Analysis:**

Task 4.4: Conduct a risk analysis for each deployment scenario that addresses:

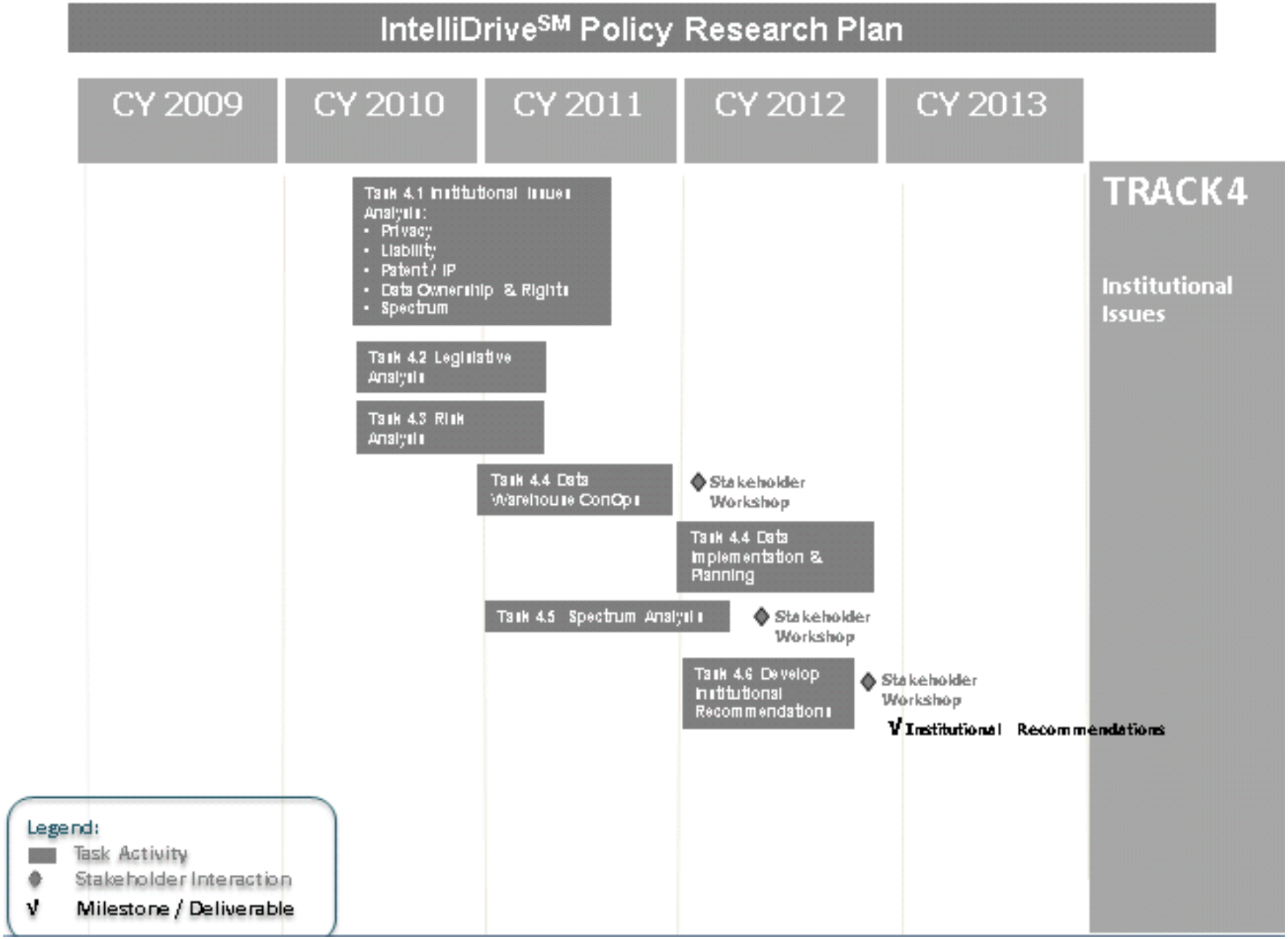
- Impact of technology evolution
- Roadblocks that may lead to deployment delays or stoppages
- Technical risks (work with the technical staff)
- Financial and business risks
- Other risks

4.5. **Data Warehouse ConOps and Implementation Planning:**

Task 4.5: After understanding the rights issues, three efforts will follow on:

- Data Warehouse ConOps that will produce options and recommendations
- Stakeholder outreach and interaction on issues and options
- Implementation issues analysis and planning

Figure 4: IntelliDrive[SM] Policy and Institutional Issues Research Roadmap
(File: Research Timeline v.8.12.01.09)



4.6. **Spectrum Analysis:**
Task 4.6: It is expected that the initial study as well as the initial IF/PPP roundtables will identify legal issues and market opportunities that may require outreach and discussion with the FCC on use of the spectrum, legal analysis, and market analysis.

4.7. **Recommendations:**
Task 4.7: Based on the results of analysis within this track, develop a set of recommendations to overcome the issues, roadblocks, and challenges for each deployment scenario.

→ For each deployment scenario, combine with an appropriate institutional recommendations. Identify the advantages and disadvantages for each.

Summary of Key Milestones:

- Institutional Issues Summary White Paper
- Institutional recommendations
- Completed deployment scenarios, combining the results of tasks 1-4.

→ With the completion of Task 4 efforts, each deployment scenario will be combined with appropriate institutional strategies and the advantages and disadvantages identified. As the deployment scenarios will have been combined with an appropriate investment option and governance structure, the institutional strategies will need to accommodate and enable them. At this point, the results of tasks 1-4 will have produced a set of *comprehensive deployment scenario options* for discussion and debate among stakeholders.

7.6 Track 5—Comparative Analysis of Completed Deployment Scenarios

Objective: The objective of this track is to compare each fully developed, completed deployment scenario against the others.

Expected Outcome: A comparative analysis that will result in an understanding of the strengths, weaknesses, and trade-offs associated with each deployment scenario.

Critical questions:

- Which option maximizes the value proposition to all stakeholders? What are the compromises that each stakeholder faces?
- Which option accelerates the deployment and adoption of IntelliDrive[SM]?
- Which option allows broadest access to all users?
- Which option leverages funds in the most optimal manner?
- Which option minimizes institutional and financial risk?
- What other market efficiencies and benefits are gained?

Proposed Tasks to Achieve Outcome (also Key Milestones):

5.1. **Results Summary:**

Task 5.1: Combine the outcomes of tracks 1-4 that provide the final, comprehensive deployment scenarios and identify the types of recommended policies and resolutions and follow-on actions in an initial *Implementations Recommendations* report for review by stakeholders.

Task 5.1: Stakeholder workshop

Milestone: Fully Developed, Stakeholder Reviewed, Deployment Scenarios

5.2. **Comparative Analysis:**

Task 5.2: Conduct a comparative analysis that assesses each deployment scenario option for its likely impact on Safety, Mobility, Environment, Market Opportunities, and Return on Investment. Included is a clearer definition of the goals and a high-level benefits-cost analysis.

Task 5.2: Stakeholder workshop

Milestone: Stakeholder Review and Recommendations

5.3. **IntelliDrive[SM] Policy and Institutional Issues Recommendations Report:**

Task 5.3: Using feedback from the workshop in Task 5.2, prioritize the options with stakeholders and discuss a process for "approval." Receive comments and prepare final *Implementation Recommendations* report.

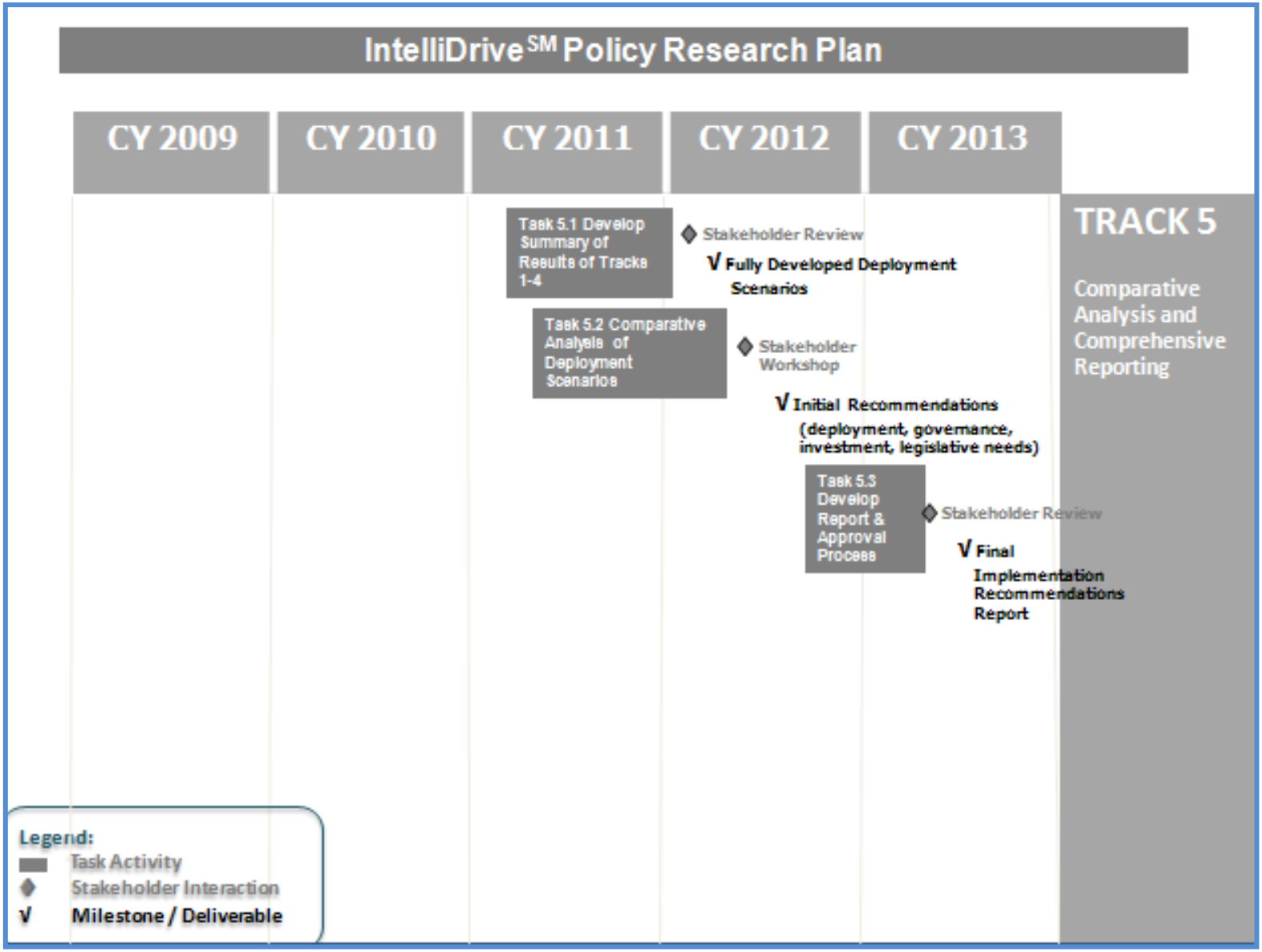
Task 5.3: Stakeholder Workshop and review before Final Report

Milestone: Initial Recommendations Report (deployment, governance, investment, legislative needs)
Milestone: Final Implementation Recommendations Report

5.1. **Stakeholder Interaction:**

Task 5.3: Two stakeholder forums to discuss findings after task 5.1 and task 5.2

Figure 5: IntelliDrive[SM] Policy and Institutional Issues Research Roadmap
(File: Research Timeline.8,12.01.09)



8.0 WORK CURRENTLY UNDERWAY

Most CY2009 projects have been initiated and are underway. Several related activities have taken place in previous years; these efforts include:

Task	Track	Status
Footprint Analysis	Track 1	Completed
Anonymity by Design	Track 1	Completed
White Paper on Public Sector Support	Track 2 and 3	Completed
IntelliDrive[SM] Principles, taxonomy and definition, vision, mission, goals	Track 1	Principles generally accepted by stakeholders.
AASHTO (Public Sector) IntelliDrive[SM] Strategic Plan	Track 4 and Track 5	Completed.
MDOT Tipping Point Study	Track 1	Underway
OmniAir Study on Certification and Authentication	Track 3 and Track 4	Completed
Privacy Policies Framework	Track 4	Completed
Legal Analysis	Track 4	Completed

There are two items of note on efforts that are related and being done in parallel with the development of this *Policy and Institutional Issues Research Plan* and the implementation of its activities:

1. The ITS Joint Program Office and the ITS Strategic Planning Group are developing the next 5-year multi-modal strategic research direction for the ITS Program.
2. The IntelliDrive[SM] Program managers are developing similar research plans for completing the technical work on:
    - The systems engineering associated with developing a new IntelliDrive[SM] architecture.
    - An ITS Standards strategic plan.
    - A V2V work plan.
    - A V2I safety work plan.
    - A mobility program work plan.
    - An environmental program work plan.

APPENDIX A: CRITICAL QUESTIONS FOR EACH TRACK

The following text contain the critical questions that will guide the research within each track. These critical questions were derived by summarizing previous research papers under the VII Program.

Track 1: Deployment Scenarios

Critical questions: For each deployment scenario identified:

- Technical Architecture Questions
  - What are the infrastructure requirements for each approach? How much infrastructure is needed to enable a variety of applications?[6]
  - What level of infrastructure is needed to enable anonymity or robust security requirements?
  - What are the estimated costs?
  - What are the assumptions about in-vehicle deployment?
  - Is the technology market-ready?
- Applications Questions
  - What are the most likely applications and what services do they provide?
- Implementation/Operations Questions:
  - How does each scenario get implemented from a technical, organizational, and physical perspective? What is the action plan associated with each deployment scenario?
  - What are the policies, decision support tools, and guidance (e.g., procurement specifications, deployment guides) that need to be in place to guide successful operations and maintenance? Do they differ for infrastructure versus vehicle deployment? Do they need to be in place in advance of major field deployment? If so, when?
  - What are the public and private sector roles and responsibilities for each deployment scenario?
  - What is the probability of sustained operations?
    - What is the timeline and growth forecast for equipped vehicles?
    - What is the timeline and growth forecast for infrastructure implementation?
    - What is the likelihood of consumer acceptance and adoption?
    - Is there a different in using an aftermarket or retrofit approach versus relying solely on embedded technologies?
  - What are the key milestones or "tipping points"?
  - What are the priorities for implementation if not everything can be done?
  - Are there examples of other large-scale deployments that are similar? If so, what can be learned from them?

[6] Note: The previous VII research analyzed many of the light vehicle-based and infrastructure-based deployment opportunities. What was not included was a defined set of research designed to analyze transit or commercial vehicle operations with enough detail to develop requirements and scenarios. As a result, this research will be included within this track.

- Overall:
  - What are the expected outcomes for each deployment scenario (for instance, does it enable active safety? Provide probe data? Etc.)?
  - What are the basic market assumptions? Who pays? Who installs?
  - What can stakeholders' influence and control, and what is outside of influence?

Track 2: Market Factors and Investment Models

Critical questions:

- What are the funding sources available? How likely is it that these sources will provide funding? What is the impact of the funding coming from each source, i.e., venture capitalists, established corporations, Federal government, State and local governments, or others?
- What are the optimal roles for private sector, State and local government and agencies, Federal government, and academia?
- What are costs of equipment, installation, operations, maintenance, user costs, access costs, and others?
- What are the most likely market and business opportunities and structures in support of each deployment scenario? What is likelihood of revenue streams? How sustainable are they? What are the actions needed to develop the market? By whom?
- What are the incentives and stimulators? How effective are they likely to be? Are there examples from other deployments?
- Who is left out?

Track 3 –Development of Governance Structures

Critical questions:

- What governance structure is most efficient and sustainable for each deployment scenario?
  - What legislation is necessary to establish authority? For whom? To do what?
  - Who has access to the system? Under what conditions and what costs?
  - What is the process for standards development, maintenance, and upgrade?
  - Who will do compliance and enforcement (for security, certification, etc.)?
  - What are associated funding strategies or revenue streams that will sustain the management of the proposed governance structure?
  - What is the optimal plan for testing and certification?
  - Who is accountable for success metrics [defined under (A)] and system performance metrics?
  - Who owns the equipment and data?
- What role does regulation play? What should be regulated under each governance scenario? What are the reasons for regulation under each governance scenario?
- How are other organizations impacted? What role might they potentially play? Are there any synergies?

Track 4—Identification of Institutional Issues and Roadblocks

Critical Questions:

- What new Federal legislation might be needed? What new State and local legislation might be needed? Would new IntelliDrive[SM] policy conflict with existing laws and regulations? In particular, what are the impacts to ROW legislation?
- For each option, how does IntelliDrive[SM] impact:
  - Privacy concerns?
  - Liability concerns?
  - Patent or IP policies?
- For each option, what are spectrum issues, including:
  - Allocation
  - Use and types of services
  - Management
  - Auction
  - Wireless backhaul
- What are jurisdictional impacts and implications? Are there impacts to emergency, security, environment, and mobility?
- What is the potential impact due to the rapidity of technology evolution and technology changes?
- What is the level of State and local policy discretion?
- What are risks and constraints that could:
  - Delay deployment?
  - Stop deployment?
  - Make deployment less successful?

Appendix B: Organizations with Governance Structures That May Inform IntelliDrive[SM]

- ***Aeronautical Radio, Inc. (ARINC)***. ARINC started as a nonprofit company supported by the airlines to administer their radio operations and has moved to a for-profit business model in support of mission-critical airline and military operations.
- ***World Wide Web Consortium (W3C)***. W3C is an international consortium where Member organizations, a full-time staff, and the public work together to develop Web standards. W3C operations are supported by a combination of Member dues, research grants, and other sources of public and private funding, and a Supporters Program.
- ***Radio Technical Commission for Aeronautics (RTCA)***. RTCA is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. RTCA functions as a Federal Advisory Committee. Its recommendations are used by the Federal Aviation Administration (FAA) as the basis for policy, program, and regulatory decisions and by the private sector as the basis for development, investment, and other business decisions.
- ***The partnership between the Federal Railroad Administration and the private sector US rail industry***, a partnership for setting safety standards and resolving right-of-way issues.
- ***Tennessee Valley Authority (TVA)***. TVA is a Federal corporation, the Nation's largest public power company, and a regional development agency. TVA receives no public tax dollars but finances all of its programs through power sales and the sale of bonds in the financial markets.
- ***The FAA's Next Generation Air Transportation System (NextGen)***. NextGen is a system similar to IntelliDrive[SM] in that it seeks to transform the National Airspace System (NAS), including our national system of airports, using 21st century technologies to ensure future safety, capacity, and environmental needs are met.
- ***Explore models relevant to the transit or CVO industries and analyze whether there are any key differences or exceptions that are needed.***
- Engage AASHTO, VIIC, transit industry decision makers, CVO industry decision makers, and other key stakeholders on the potential benefits and the institutional issues associated with the different governance structures. Explore issues associated with deployment, market development, and ongoing sustainability.