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"Transportation Research Priorities: Maximizing Return on Investment of Taxpayer Dollars"

Testimony of Lynn Peterson

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Good morning Chairman Quayle, Ranking Member Wu and Members of the Subcommittee. My name is Lynn Peterson and I am the Sustainable Communities and Transportation Policy Advisor to the Governor of the State of Oregon.

I would like to begin by thanking you for this opportunity to share our views and perspectives on our ongoing research and development activities. On behalf of my colleagues in academia, government and industry, I appreciate this chance to address the technical, regulatory, social and financial challenges to implementing new measures and integrating new technologies into existing transportation networks.

The State of Oregon has a long history of research and development, and we learn from the cutting edge application of policies and technology we have put in the field. This has encouraged an environment of learning within the state. I have benefitted as a professional of having this environment by receiving two masters degrees from Portland State University (transportation planning and engineering), and the citizens have benefitted with increased efficiencies, choice of modes, environmental quality and safety.

Oregon has focused on applied research, which has allowed us to do more with less. In order to maximize this approach, we need all federal programs to be as flexible as possible so that Oregon and other states are allowed to make the most effective use of limited funding, leverage resources and maximize their economic competitive advantages.

There are four things I hope you will take to heart from this testimony. The first is that you will appreciate the key role that research plays in continuing to meet the mobility needs of Americans and building stronger communities.

The second is that virtually every aspect of our transportation system needs to be transformed in the short and medium term future, and this challenge can only be met through innovations developed through research. Congestion threatens our economic viability and our quality of life. Fuel taxes, which currently provide the core of transportation funding in America, are not able to

keep pace with the cost of preserving, maintaining and operating our transportation system, much less improving it. Energy consumption by the transportation sector frustrates efforts to achieve energy independence. The future transportation system needs to be safer, cleaner, more efficient, more equitable, more reliable and more cost-effective. Research will play an indispensable role in achieving those objectives. We value research in spite of limited resources because research spurs innovation and helps to tackle difficult transportation issues.

The third is that in Oregon our research needs exceed our research resources. The scope of our research activities are largely limited to applied research which has applicability primarily to local conditions in Oregon. Oregon and other states rely on other programs to carry out applied research that has regional and national applicability. We also rely on other programs, such as research conducted by University Transportation Centers (UTCs) and sponsored by USDOT and the Transportation Research Board, to pursue more advanced research. Advanced research, like applied research, also has a practical objective, but it tackles bigger and less tractable problems in transportation. The next transportation authorization needs to continue to provide a means of addressing the needs of applied and advanced research which is regional and national in scope.

Fourth, in Oregon we have developed a very successful model of collaboration between our research universities and between the Oregon Transportation Research and Education Consortium (OTREC), the state department of transportation (ODOT) and local governments. This collaboration allows us to stretch our resources further and leverage our expertise and funding across our institutions, and it ensures that research is able to be put into practice more effectively. Oregon's model can be used by other states and universities as a way to build a successful research partnership.

The Value of Research

I would like to offer a number of instructive examples of how research efforts can be applied in the real world and help government agencies stretch public resources further and address emerging challenges.

Cracked Bridges. A decade ago, ODOT discovered a widespread cracking problem in a specific type of reinforced concrete girder bridge that affected approximately 500 bridges statewide. Under existing load rating criteria these bridges would have to be replaced, repaired, closed or weight-restricted for heavy trucks, causing significant economic costs to our trade-dependent state. ODOT undertook the $1.3 billion Oregon Transportation Investment Act (OTIA) III State Bridge Program to repair and replace hundreds of bridges, which was by our state's standards a massive investment. In the meantime a series of ongoing research projects were able to demonstrate that given allowable revisions to load rating procedures, many of these bridges could be shown to be safe with only repairs or without any work. As a consequence, almost 200 bridges were either downgraded from replacement to repair or removed from the list of bridges needing work entirely. This research saved Oregon almost $500 million.

Effective Bridge Repairs. Oregon has many older reinforced concrete bridges still in service that are showing signs of cracking and need to be strengthened or replaced to maintain safe and efficient travel, particularly for heavy trucks. However, ODOT simply does not have enough

money to replace all of these bridges and instead is focusing its limited resources on cost-effective repairs that keep bridges in service longer. To do this, ODOT has conducted research to test effective repair techniques. Of particular concern is the capability of girders and cross-beams in bridges to withstand forces caused by bridge self-weight and truck traffic. ODOT has used a number of methods for increasing the capacity of girders and cross-beams, but there was no comparison of these techniques that could help engineers decide which method was most appropriate for a particular situation. ODOT contracted with Oregon State University to conduct testing on large-scale beams in order to compare the various repair methods, analyze the expected life and make recommendations for repair approaches. The outcome of the research provides bridge designers with a basis for selecting repair methods, and it provides guidance on calculating design capacity for the repairs.

Expediting Project Delivery While Improving Environmental Outcomes. The Transportation Research Board's Strategic Highway Research Program 2 (SHRP2) funded research carried out by OTREC faculty members to develop an Ecological Assessment Method for Highway Capacity Projects. This research built on earlier work by ODOT to develop a method for systematically aligning transportation and conservation priorities to achieve improved environmental outcomes and accelerate project delivery. ODOT used this approach in securing environmental permits under the $1.3 billion OTIA III State Bridge program. ODOT saved $3 for every dollar it invested in this approach during the bridge program, with total savings of $73 million. TRB has now funded a smaller metropolitan planning organization in Oregon to test the methodology. This approach could potentially transform environmental permitting for transportation projects from a prescriptive command and control approach to an outcome-based approach that saves time and money and leads to better environmental outcomes.

Energy Independence and Economic Competitiveness. OTREC is conducting research that will help develop tools for local governments in reducing air pollution and meeting energy independence goals, all of which links back to mobility and the economic competitiveness of our communities. OTREC research has paved the way for advances in a number of areas. In the area of emissions, breakthroughs have been made on linkages between the impact of emissions and health of pedestrians, bicyclists, public transit users and residents due to exposure to particulate matter. Important advances are also being made in the area of fleet replacement models that consider hybrid and alternative fuels in addition to impacts on emissions.

Researchers are currently analyzing the relationship between vehicle miles traveled (VMT) and economic activity to see if there is reason to be concerned about the impact that VMT reduction might have on local economic activity. Researchers are helping to explore wider application of land use models and adapting analytical methods to better reflect the relationship between land use, transportation and travel demand for specific land use types. This is extremely important in determining the impact of different development types on the transportation system.

Examples of non-motorized travel research completed and underway include integrating bicycling to improve the regional travel demand model, understanding bicyclist route choice, investigating the effectiveness and safety implications of various bicycle infrastructure and the relationship between bike infrastructure and cycling activity to the patronage of local businesses.

As it relates to commercial goods movement, one particularly innovative and completed research project focuses on the development of multi-criteria tools for measuring and analyzing the impacts of congestion on freight and the impact on reliability, delay, costs and emissions.

While no single strategy will significantly reduce the transportation system's energy consumption, together these efforts will move us toward meeting state and national goals.

Overview of Transportation Research in Oregon

The two key components of Oregon's transportation research system are the Oregon Department of Transportation (ODOT) and the Oregon Transportation Research and Education Consortium (OTREC).

Our model in Oregon has been based on partnerships and collaboration since day one. Oregon's research program has been more successful than many state DOT programs in finding common ground with and leveraging assistance from University Transportation Centers. Part of the mission of University Transportation Centers is service to and collaboration with state transportation departments, and OTREC has been a strong partner with the state and local governments, including MPOs, transit districts and Port authorities.

ODOT's Research Program

Again, transportation research needs of the states are primarily applied research to solve specific problems. The state Departments of Transportation generally expect a research project to deliver a product that can be put directly to use by the agency. Research interests are broad and eclectic, though most states do have well-defined priorities that change as problems are solved and as conditions change. Because states expect our research results to be used, these state programs also have a strong technology transfer or implementation component.

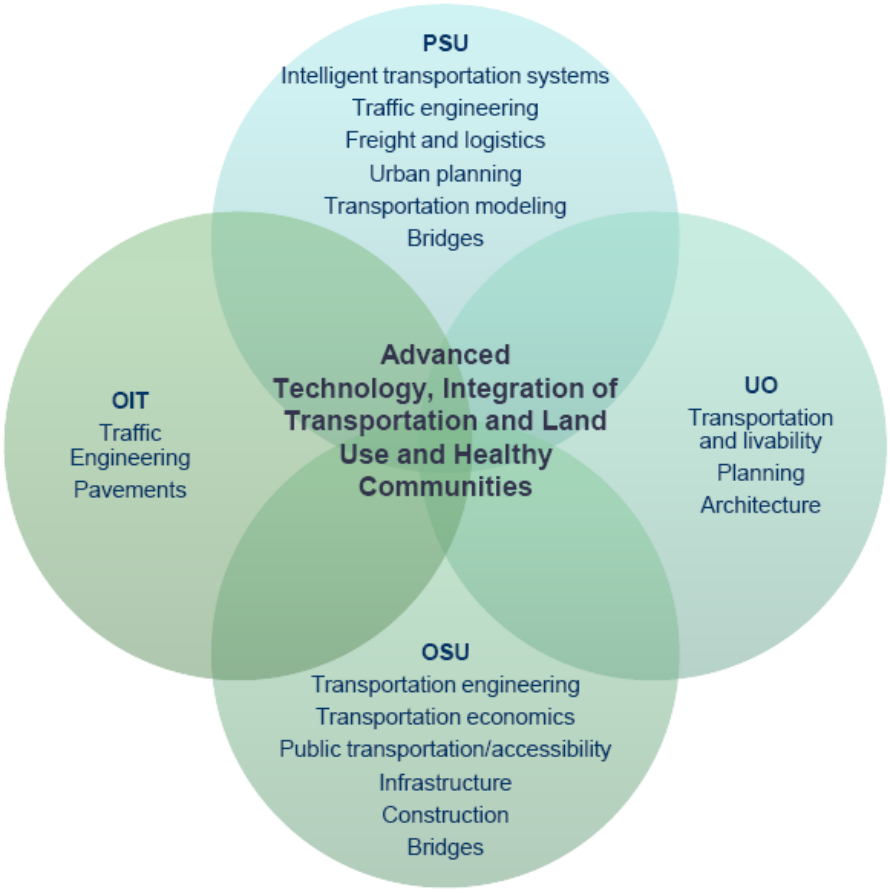
The research and development that Oregon carries out independently focuses on the unique circumstances of the state: its geography, geology, climate, state laws and existing practices. For example, most states use the same engineering design manuals and guidebooks for structures, pavements, highway capacity, safety and traffic control devices. When these manuals are revised or updated, additional research is needed to adapt them to local conditions. Recent major revisions to the pavement design guide and the release of the new Highway Safety Manual triggered research efforts in Oregon and in other states to make these tools more readily usable given local conditions.

State DOTs receive research funding through the Federal-Aid Highway Program. Under the State Planning and Research Program (SP&R), two percent of each state's federal transportation funding is set aside for planning and research activities. This system allows each state to address its top concerns and identify solutions at the state level. Since the research program is a portion of each state's federal funding, any reduction in federal funding for surface transportation in the next authorization bill will reduce funding for research as well, just at the time that more resources will be needed to find the best ways to stretch public dollars further.

States rely on others to conduct applied research which is regional or national in scope and to pursue advanced research. For research that is of interest for more than one state, Oregon and most other states use the Transportation Pooled Fund (TPF) Program and/or the Cooperative Research Programs administered by the Transportation Research Board. These programs allow states to easily partner and leverage resources to solve common problems of a regional or national scope. For example, Oregon and other states recently teamed up for a pooled fund research project to examine strategies and best practices for state DOTs to support commercialization of electric vehicles and infrastructure, a key emerging technology that has strong potential to advance energy independence.

Oregon Transportation Research and Education Consortium (OTREC)

The Oregon Transportation Research and Education Consortium (OTREC) is a National University Transportation Center that was established in December 2006 through a partnership between Portland State University, the University of Oregon, Oregon State University and the Oregon Institute of Technology.



OTREC has chosen three focus areas: advanced technology, integration of transportation and land use and healthy communities. Each of these four institutions of higher education bring their unique expertise to the table, providing a relatively small state like Oregon the best opportunity

to have a world-class transportation research center. The figure above illustrates how the many disciplines at the four campuses are interrelated around the consortium's theme.

OTREC has funded 100 research projects involving 89 faculty members and 13 laboratories and research groups. All projects include external public and private matching partners with a total of 42 different entities involved. OTREC is multidisciplinary, with 22 different academic disciplines currently participating in our projects.

Collaboration is strongly valued by OTREC, our partner universities and our many stakeholders, and it has been woven through our activities as an important cornerstone:

- ***New Collaboration Among Faculty.*** Faculty are encouraged throughout the proposal and project process to think of innovative and collaborative approaches to research, education or technology transfer. To date, 32 projects involve faculty at more than one campus and 78 have multiple investigators.

- ***Strong Ties to ODOT and Transportation Community.*** More than 42 external partners provide matching funds of cash or in-kind support for faculty-led projects. ODOT is a primary partner, jointly funding nearly half of OTREC's research projects selected to date.

- ***Regional Collaboration.*** OTREC is part of the Region X Transportation Consortium, made up of UTCs in Oregon, Washington, Idaho and Alaska, as well as the four state DOTs, with input and participation by representatives of the USDOT. The Consortium funded one joint project focusing on regional impacts of climate change and teamed up to offer the first long-distance, multi-campus class between Oregon and Idaho.

- ***National Connections.*** OTREC strives to meet national transportation research and education needs and is active with the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), the Council of University Transportation Centers (CUTC) and other national activities.

OTREC uses the national DOT priorities to guide its research program. It is encompassed in the strategic plan, and every research proposal needs to relate back to one or more of the national priorities. One of the more significant activities that ensure that federal research efforts are coordinated at the state level is the involvement of OTREC staff and affiliated faculty in the TRB committees and research panels. Fifteen OTREC-affiliated faculty and staff represent 30 different committees and panels at the national level. Participation in national-level research activities ensures that research is better coordinated and avoids duplication.

ODOT and OTREC work very closely together to address research needs, using State Planning and Research funding to leverage UTC funding, thereby stretching state resources further. ODOT employees are involved directly in governance of OTREC, and OTREC has a direct role in governance of ODOT's research program. State Planning and Research Program funding, which is eligible as match for UTC activities, is a very valuable tool for fostering partnerships. State funding beyond the State Planning and

Research Program has been used to leverage federal funds and has contributed to advancing issues of national significance.

OTREC has also fashioned similar relationships with Oregon's MPOs, transit districts, local governments and Ports. Joint research efforts have been established around freight and goods movement, transit operations, active transportation and healthy communities. Those relationships help to further leverage UTC funds.

Alongside research, OTREC's mission includes educating the current and future workforce and sharing and implementation of research results. OTREC has been particularly successful in elevating the number of graduates enrolled in transportation degree-granting programs. OTREC requires that every research project involves undergraduate or graduate students – a strategy that helps to train the future transportation workforce. OTREC estimates that approximately 102 graduate students and 48 undergraduate students have worked on OTREC-funded projects over the last four years. The most prominent outcome is helping to establish a graduate program at Oregon Institute of Technology that attracts students from the smaller and rural communities in Southern Oregon.

Disseminating Research

The research conducted in Oregon has broad-reaching impacts on public and private sector work in transportation, helping to better inform and educate professionals and institutions. Researchers work hard to communicate their research results to transportation professionals who can put that research into action.

ODOT and OTREC have undertaken a number of efforts to disseminate research to a broad audience. For example, ODOT Research publishes brief summaries of research reports for use by practitioners. These are available online and are distributed through the state's Local Technical Assistance Program (LTAP) Center. ODOT Research staff routinely attend agency-sponsored training events both to market research services and to disseminate research results.

OTREC, along with many local partners, coordinates the annual Oregon Transportation Summit. The Summit is an opportunity to showcase important advances in research as well as an opportunity for stakeholders to provide insight into the most pressing needs of their agencies and organizations. The feedback obtained from the Summit has been used to guide research emphasis areas for OTREC's annual solicitation process.

Similarly, the Northwest Transportation Conference brings nationally known speakers and supplements them with research and subject matter experts from Oregon universities and transportation agencies as well as the private sector. Presentations are often based on recently completed research and research in progress. The program is developed to offer something for the entire spectrum of the transportation workforce from the snowplow operator to the chief executive.

ODOT Research also offers a number of training events. Street maintenance and collection schools that target the blue collar end of the public works workforce in Oregon. Courses address

recent innovations in equipment, employee and work zone safety, signing and roadway marking materials, storm water management and other topics concerning innovations and new technology relevant to city and county road maintenance supervisors and workers.

Over the past year, OTREC has focused on disseminating research results in more usable formats and has developed a communications strategy for what information, to whom and at what stage during a research project the information should be communicated. OTREC recognizes the need to translate the work of academics in a format that can be easily understood by agencies, decision-makers and the general public. Through a more concerted effort to develop project briefs and news articles, OTREC has seen an increase in the media and public interest in our research results. OTREC has also had good success in sharing results in weekly OTREC seminars open to the public and streamed over the Internet.

Since inception, OTREC has funded 19 education and 14 technology transfer activities. Among the array of workshops and technology transfer activities offered, the most significant interest nationally is OTREC's light rail short course.
One other key element in the system of getting innovations out to local governments is FHWA's Local Technical Assistance Program. This program funds a center in each state, the role of which is training and technology transfer serving the state, local and tribal transportation agencies within the state. LTAP is the primary conduit through which innovations developed throughout the system are put into the hands of potential users at the local level, in a form that they can use.

Transportation Research Needs of the States

Each state differs in funding and priority needs for transportation research, but we share many in common. These needs are necessary for all states to increase economic competitiveness, especially in times of recession. Increasing focus on practical design, context-sensitive solutions, maximizing the efficiency of the existing system and preserving the system and freight movement will allow states to do more with less when investing their transportation dollars.

Oregon has identified a number of gaps in research:

- ***Efficiency.*** In the future, increasing highway capacity cannot be relied on exclusively to address transportation needs. We need to find ways to use existing capacity more efficiently, encourage development and use of alternative modes and manage growth through strategic and effective land use planning. Research is desperately needed in all these areas, in Oregon and nationally.

- ***Seismic Activity.*** Seismic vulnerability is a major concern in the Pacific Northwest region because of new and better understanding of the Cascadia subduction zone 200 miles off the Oregon coast, which presents the potential for a magnitude 9 earthquake and an attendant major tsunami. The Japanese experience has taught the importance of keeping lifelines open for emergency response. Research is needed to pinpoint the risks and to prioritize remedial actions.

- ***Mileage-Based User Fees.*** Fuel taxes are rapidly becoming an obsolete tool for transportation funding as fuel efficiency improves and alternative fuels become more prevalent. Oregon has been a leader nationally in the move toward mileage-based road user fees. Making a transition to a suitable alternative has a significant research component.
- ***Energy.*** One way states can help advance energy independence and combat global warming is to use the transportation system itself to produce clean energy. ODOT's Solar Highway program has taken the first steps in that direction, and there are a number of promising nascent technologies that need to be explored, evaluated and tested.

Advanced Research

As noted previously, states focus on applied research. Advanced research, in contrast, seeks to make progress toward a solution to a critical transportation problem, but without expecting to reach a solution within the scope of a single project. Advanced transportation research currently falls within the scope and responsibilities of University Transportation Centers and the various advanced research initiatives of the USDOT. While the DOTs do not engage in advanced research, it is important to Oregon and to the rest of the states that someone is tackling the bigger problems in transportation.

Stakeholder Needs Identified in USDOT Prioritization

Oregon supports the top five key USDOT priorities. However, a number of other key areas could be emphasized and are perhaps not fully captured in the key priorities as currently stated. These include the following:

- ***Resiliency in the Face of Natural Disasters.*** Given the real and present impacts of recurring natural disasters and climate change on transportation infrastructure and communities across the country, more research and inclusion of resiliency across all key priorities is needed. Communities that are designed for change such as economic conditions, fuel prices and climate will be better adept at bouncing back in harrowing times. There are clear examples such as the rebuilding efforts that currently continue as a result of Hurricane Katrina and the communities recently devastated by flooding and tornadoes.

- ***Consider Equity Issues Across All Priorities.*** Vulnerable populations from the elderly to the socio-economically disadvantaged need greater consideration across all key priority areas. Similar to resiliency, transportation equity is yet another cross-cutting issue. For example, those who are most at-risk on the roads are older adults, the poor who cannot afford more advanced vehicle safety features and kids (where vehicle crashes are the leading cause of unintentional injuries and deaths). Another example is providing good access to sidewalks and better linkages between transit, pedestrian and bike facilities that make these viable transportation options for the vulnerable populations that cannot drive or own a vehicle. And equity needs to include a joint transportation and land use component to better link social and community services with disadvantaged populations.

- ***Align Performance Measures With New Policy Direction.*** Useful measures help states and MPOs better allocate scarce transportation dollars and better describe system performance to the public. Prevailing performance measures that have been used to historically characterize our transportation system are at odds with the direction that policy decisions are headed. Measures of success are evolving to reflect cross-modal benefits and better represent the transportation system as a whole. The research strategic plan should evaluate the applicability of traditional measures such as benefit-cost ratios or volume-to-capacity ratios across all modes and explore other options that support the Department's policy direction.

- ***Consider Health as Another Key USDOT Priority.*** Given the obesity, diabetes, asthma and other chronic disease epidemics stemming from the lack of physical activity and air pollution in addition to the exorbitant health care costs the US is facing, health should be included as a sixth priority. This would address issues such as increasing walking and bicycling, as well as the issues that relate to an aging population and safety and accessibility issues of all users of the transportation system. Health impact assessments are also being integrated across the country as part of the transportation planning process and this perspective is gaining momentum at local levels.

- ***Recognize Active Transportation as a Mode.*** Active transportation, such as bicycling and walking, needs to be recognized as a mode, particularly because it is among the most cost-effective investments in improving the transportation system. This national recognition may be a catalyst for cities and regions that are seeing significant increases in bicycling, walking and non-motorized travel to help further implement infrastructure and safety programs. It would also encourage other areas to see active transportation as a practical strategy among others that can help address climate change, congestion, safety, health and equity issues.

Recommended Changes to Reauthorization of Surface Transportation Bill

In looking ahead, we feel there are some opportunities for policy changes that would help to improve research both at the national and state level. For the next surface transportation bill, we urge you to consider some small but important changes that would encourage collaboration, in turn further leveraging existing resources. These changes include:

Broadening Federal Match for University Transportation Centers (UTCs)

USDOT should re-examine match requirements and allow other federal sources as match (e.g., other USDOT, NIH, CDC, NSF, etc.). The next iteration of the USDOT research strategy should foster closer cooperation with other federal agencies such as the US Environmental Protection Agency to work on greenhouse gas emission issues, the National Institute of Health to examine linkages between transportation and health policies, the Department of Housing and Urban Development and the Department of Energy to explore alternative energy for transportation. Allowing federal match dollars from these potential partners would encourage cross-agency and cross-discipline collaboration. In addition, federal transportation dollars from a metropolitan

planning organization (MPO) should be eligible as match. Having a comparable program for MPOs similar to allowing federal State Planning and Research (SP&R) funds to be used as match would accelerate research innovation and adoption of federal priorities. For example, Metro (the Portland regional MPO) is an active research partner with OTREC making significant advances in modeling. They are seen as a leader nationally in adopting and applying innovative transportation planning and operational strategies.

While there is widespread cooperation and collaboration between Metro and OTREC faculty, the inability to use Metro federal funding sources (both in-kind and/or cash) is a real barrier for leveraging local resources. In addition, the smaller MPOs in Oregon want to partner on research but have no non-federal funding available for research. Broadening the federal match eligibility would broaden local partnerships, reduce duplication and improve efficiency.

Streamlining the Adoption of New Innovations

The current processes for adopting best practices and innovation need to be examined to find ways of encouraging or rewarding research with visible outcomes. For example, the current process for adopting and updating the Manual for Uniform Traffic Control Devices is difficult and stifles innovation. The state of the technology and innovative treatments being developed locally and regionally are constantly evolving. However, a shortage of funding directed at evaluating new, innovative technologies (including traffic control devices) limits the amount of innovation possible. Innovation that is proven and could help to advance the state of practice across the country is often hampered by slow policy changes. A new integral part of the DOT research program could be a way to help streamline the process for researching, evaluating and adopting new innovations.

Research on Mileage-Based User Fees

In order to transition the transportation system to a user fee that is more sustainable in the long term, the next surface transportation authorization should create a research program designed to develop a mileage-based user fee system. This should include creation of a policy group within USDOT to oversee development of a mileage-based user fee system, as well as funding research and development efforts consisting of pilot projects and implementation trials that will identify the best option for a mileage-based user fee and design the system and technology required for implementation.

Making Better Linkages Between Research Groups

We encourage more visible connections with and between national laboratories and research groups, including UTCs. The USDOT Research and Innovative Technology Administration should continue playing that role and help to communicate the work that is happening among the various groups. These connections again would help to broaden partnerships and promote collaboration.

Flexibility in Research

Oregon's success in working with University Transportation Centers is not typical across the country. UTCs are expected to carry out advanced research within a defined topical subject area. State DOTs are interested primarily in applied research across a broad spectrum of topics. This can make common ground difficult to find.

If the expectation is that states and UTCs should work together then there needs to be more flexibility in the expectations placed on UTCs regarding their research mission, so that they can respond to both national priorities and at the same time be responsive to the needs of the states.

Leadership and Strategic Direction

There is a need for leadership and guidance from the USDOT on national research priorities. In order for the various players to do their parts, goals need to be articulated and hard choices need to be made about what is important enough to focus scarce resources on.

In a few areas there are detailed, well-articulated roadmaps for research. An example is the *Concrete Pavement Roadmap*, a 10-year strategic plan that outlines approximately $250 million in needed concrete pavement research that will help develop a comprehensive, integrated and fully functional system of concrete pavement technologies. However, for most topic areas we have little more than very high-level summaries such as *Highway Research and Technology: The Need for Greater Investment*, the report of the National Highway R&T Partnership. Development of more detailed research roadmaps in DOT priority areas may help to provide clearer direction.

Conclusion

Thank you once again for the opportunity to address the Subcommittee regarding transportation research needs of the states. In a down economy, research and innovation prove invaluable in providing new ideas and developing innovative solutions to help us do more with less and address rapidly changing realities.

Oregon is a model for coordination and dissemination of research. The work of OTREC and ODOT has been very successful at maximizing the effectiveness of the money we invest in transportation research, and our state has seen the benefits of that in several instances discussed in this testimony.