Texas Highway Funding Options

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16. Abstract

This study was designed to provide strategic information on highway funding options and alternatives in preparation for the 2013 Texas Legislative Session. The contents evolved during the research team's two-semester interaction with senior TxDOT staff, led by Mr. Phil Wilson, Executive Director. Three workshops narrowed the scope to the four finance issue briefs on the following subjects: energy sector infrastructure financing in selected U.S states, weight distance charges, electric vehicle fees, and toll road availability payments. Each brief follows this structure: executive summary, purpose, key points, lessons learned, relevance to Texas, and appendices.

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Foreword

The Lyndon B. Johnson School of Public Affairs, University of Texas at Austin, has established interdisciplinary research on policy problems as the core of its educational program. A major part of this program is the nine-month policy research project (PRP), in the course of which two or more faculty members from different disciplines direct the research of 10 to 20 graduate students of diverse backgrounds on a policy issue of concern to a government or nonprofit agency.

During the 2012–2013 academic year, the Texas Department of Transportation (TxDOT) funded, through the Center of Transportation Research (CTR), a policy research project on "Texas Highway Funding Options and Alternatives." The research team was initially assigned three major tasks to perform in preparation of the 2013 Texas Legislative Session:

- Identify a menu of feasible practical funding options to support state highway infrastructure investments in the movement of people and freight, as well as mechanisms designed to ensure the optimum use of existing infrastructure;
- Assess the comparative merits of viable options in terms of revenue generation potential, equity considerations, administrative costs, technical feasibility of implementation, and other evaluation criteria; and,
- Suggest alternative mechanisms to educate and inform the public regarding the seriousness of the transportation challenges.

The contents of this final report evolved through the research team's interaction with key transportation officials throughout the course of the academic year. Overall direction and guidance was provided by Mr. Phil Wilson, Executive Director, TxDOT. Mr. Wilson participated in three separate workshops (October 2 and December 7, 2012 and February 8, 2013) to react to interim findings and then to narrow the scope of study. As a consequence of guidance provided during the December 7 workshop, the scope of study was narrowed to producing four finance issue briefs on the following subjects:

- Energy Sector Infrastructure Financing
- Weight Distance Charges
- Electric Vehicle Fees
- Toll Road Availability Payments

The following template was also approved for each of the above-mentioned briefs:

- Executive Summary
- Purpose
- Key Points
- Lessons Learned
- Relevance to Texas
- Appendices

Acknowledgments

This policy research project would not have been possible without the generous contributions of assistance of a great number of individuals and organizations, who are properly cited in the four finance issue briefs. As previously mentioned, overall direction and guidance was provided by Mr. Phil Wilson, TxDOT's Executive Director. We are also indebted to the following TxDOT officials for participating in weekly class presentations on a variety of topics, sharing information and data, and suggesting useful contacts:

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In Memoriam

In memory of Dr. Shama Gamkhar, LBJ School faculty member from 1996 to 2013. Her colleagues and students will miss her.

Energy Sector Infrastructure Financing

I. Executive Summary

Energy exploration in the United States is driven by hydraulic fracturing, a process which imposes additional infrastructure needs in those states where new oil and gas is being produced. Hydraulic fracturing requires a substantial variety of materials, most supplied by trucks which ultimately use farm to market and county road systems not designed for their use. These truck volumes have accelerated the consumption of highway infrastructure and lowered safety levels, creating a financial need not easily funded from traditional highway user fee mechanisms.

In Texas, the use of hydraulic fracturing continues to expand in the Eagle Ford Shale region and the counties impacted by this process are struggling to find adequate funding to repair local roads and maintain safety standards for the traveling public. Texas currently has no statewide strategy for financing road repairs resulting from the energy sector impact on roadways.

Several states along the Marcellus Shale formation have also been heavily impacted by hydraulic fracturing and have concluded that a "user payment" method is an effective strategy for funding the necessary road repairs resulting from energy companies expanding efforts in the area. In particular, Road Use Maintenance Agreements (RUMAs) have proven to be a successful mechanism in Ohio and West Virginia, and could provide a solution for Texas' infrastructure financing needs.

The main lessons learned by both West Virginia and Ohio are the cost effectiveness of upfront road improvements in regions developing shale gas reserves and the importance of early coordination with energy companies in order to facilitate the adaptation of RUMAs for the industry. These lessons can provide insightful experience to TxDOT if considering utilizing similar agreements.

II. Background

Hydraulic fracturing or "fracking" is a process conducted by energy companies to extract oil and natural gas from shale rock formations. Hydraulic fracturing requires the transportation of large volumes of water to and from the well site, causing many heavy loads to traverse the farm to market and county roads surrounding the site. These roads, many built in the 1950s, were not designed to sustain such weight as required for hydraulic fracturing activities. Many of the affected counties do not have sufficient funds to repair the road damages. Currently, Texas does not have a statewide strategy for addressing this issue.[1] Other states impacted by the shale boom have adopted various strategies to address these funding needs, as is shown in Table 1.

[1] Fehling, 2012.

Table 1. Energy sector infrastructure financing mechanisms[2]

State	Additional Appropriations	Maintenance Agreements	Bonding	Impact Fees
Texas	Yes			
North Dakota	Yes			
Louisiana			Yes	Yes
Pennsylvania		Yes	Yes	Yes
Ohio		**Yes**	**Yes***	
West Virginia		**Yes**	**Yes**	

*Bonding is an optional component of RUMAs in Ohio.

As seen in Table 1, both Texas and North Dakota have addressed the issue by obtaining additional state or Federal appropriations to finance their infrastructure needs. Louisiana has taken more of a local government initiative, encouraging individual parishes to negotiate financing responsibilities with the energy companies through bonding and impact fees. Pennsylvania, Ohio, and West Virginia all use a combination of maintenance agreements and bonding. Maintenance agreements require energy companies to pay for necessary road repairs (or, in some cases, upfront improvements). They often include a bonding requirement. A bond is a dollar amount (similar to a security deposit) that the well operators must commit to ensure that they will operate within the parameters of their road use maintenance agreement.

Maintenance agreements and bonding are notable in that they place the costs of road repairs with energy companies rather than state or local governments. The sections below discuss in more detail the use of Excess Use Maintenance Agreements in Pennsylvania and the use of RUMAs in Ohio and West Virginia. The remainder of this report focuses on the use of RUMAs as a useful and relevant financing mechanism for Texas.

Pennsylvania: Excess Use Maintenance Agreements and Impact Fees

Pennsylvania, one of the first states impacted by hydraulic fracturing, uses Excess Use Maintenance Agreements to require the energy sector to make repairs to roads impacted by their activities, and to post a bond for their routes.[3] Although the Excess Use Maintenance Agreements have helped to facilitate road repairs in Pennsylvania, the energy industry is learning that making improvements to impacted roadways before the commencement of drilling activities may ultimately be more cost-effective.[4] Pennsylvania also charges an impact fee for each drilled well, which is set based on the Consumer Price Index and natural gas prices.[5] The proceeds from the fee are distributed to state and local governments, but are not specifically earmarked for infrastructure needs.[6]

[2] Hazlett, 2012; Holtsclaw et al., 2013; Jones, 2013; MacAdam, 2012; Tinjum, 2012; Wilson, 2013.
[3] Matter et al., 2013.
[4] Matter et al., 2013.
[5] Hazlett, 2012.
[6] Hazlett, 2012.

Ohio and West Virginia: Road Use Maintenance Agreements

Ohio and West Virginia both use Road Use Maintenance Agreements (RUMAs) to address the infrastructure impacts stemming from hydraulic fracturing. These agreements are similar in principle to Pennsylvania's Excess Use Maintenance Agreements in that they hold energy companies financially responsible for the infrastructure impacts of hydraulic fracturing. However, one key difference is that they require energy companies to make improvements to insufficient roads *before* drilling activity begins, as well as maintain and repair the roads throughout the hydraulic fracturing process. RUMAs are an interesting solution to the infrastructure problem because they place the burden of road improvements with the energy companies, rather than with state or local governments. Additionally, in states like Ohio where roads are maintained by counties or townships, RUMAs can be implemented locally without the need for a large role for the state Department of Transportation (DOT). For these reasons, RUMAs provide a potential solution for addressing the infrastructure impacts of the shale industry in Texas.

III. Key Policy Issues

Both Ohio and West Virginia use RUMAs to address the infrastructure impacts associated with hydraulic fracturing. The RUMA is a legal agreement between the well operator and the state or local authority. RUMAs hold energy companies responsible for road maintenance and repairs, as well as for upfront improvements if they are necessary. In both states, legislation requires that a RUMA must be in place before a well operator can receive a drilling permit. Table 2 presents general information about the use of RUMAs in Ohio and West Virginia, and the sections that follow discuss in detail the background, development, and implementation of RUMAs in the two states.

Table 2. Comparison of RUMAs in Ohio and West Virginia[7]

	Ohio	West Virginia
Agreement between	• Well operator and local authority	• Well operator and WVDOT
Authority	• State, local, and industry representatives created standardized RUMA • Requirement enacted in 2012 legislation	• WVDOT negotiated policy with industry • Requirement enacted in 2011 legislation
Role of State DOT	• Issues permits for state routes • 3rd party facilitator during RUMA development	• Negotiates RUMAs with well operators • Monitors road condition throughout process
Bonding Component	• Optional; not widely used • $150,000-$400,000 per mile, depending on type of road	• Required for every RUMA • $1 million for state-wide bond, $250,000 for single district • If WVDOT calls in bond, all covered routes are shut down

Use of RUMAs in Ohio

Background on Shale Activity

Hydraulic fracturing activity in Ohio is centered in the Marcellus and Utica shale plays. The shale industry reached Ohio in 2011, with activity centered in Carroll County and focused on wet gas extraction.[8] There are currently over 500 shale wells in Ohio.[9] Chesapeake Energy is a major player in Ohio, with over 100 wells in the state.[10]

Ohio Department of Transportation (ODOT) officials traveled around the state in 2011, letting local governments know that shale drilling was coming. The primary concerns were environmental and infrastructure impacts.[11] Energy companies came to Ohio having learned in Pennsylvania that upfront improvements could be much more cost-effective than *ex-post* road repairs.

State Jurisdiction over Roads

Ohio is a home rule state; the state is responsible for state highways, while counties and townships are responsible for all other roads.[12] Approximately 40% of shale drilling sites in Ohio are directly connected to a state highway. Since state highways are designed to handle the truck loads from the shale industry, well operators may simply obtain a permit from ODOT to use state routes and are not required to enter into a RUMA. The remaining 60% of truck activity occurs on

[7] Holtsclaw et al., 2013; MacAdam, 2012; MacAdam, 2013.
[8] MacAdam, 2012.
[9] Ohio Department of Natural Resources, 2013.
[10] MacAdam, 2012.
[11] Ibid.
[12] Ibid.

county and township roads, which often are not built to accommodate the heavy truck traffic.[13] Therefore, in Ohio (as in Texas), it is the roads maintained by local jurisdictions, rather than those maintained by the state, that are most in need of improvements due to shale activity. In Ohio, RUMAs are established between energy companies and counties or townships, rather than with the state DOT. This can make the RUMA process more cumbersome for energy companies to navigate, since they must negotiate with different local authorities depending on the location of the drilling site.

History/Development of RUMAs

Prior to the shale boom, RUMAs were used in Ohio to address road impacts from the coal and timber industries. When the shale boom reached Ohio, these agreements were adapted to address problems posed by hydraulic fracturing. At the time, RUMAs were not standardized between counties and townships, and varied in length and requirements. In 2011, the state DOT convened stakeholders to craft a standardized RUMA to apply to the shale industry. Over the course of three meetings, 31 stakeholders—including county commissioners, township trustees, county engineers, energy sector representatives, and state emergency management and natural resources officials—drafted a standardized RUMA. Due to the nature of road jurisdictions in Ohio, the state DOT played a facilitation role in these discussions, since its own routes were not heavily impacted by shale activity.[14]

Once drafted, the standardized agreement was taken to the state legislature, where it was enacted into law as Senate Bill (SB) 315 on June 11, 2012. The legislation is broad, requiring a RUMA to be negotiated between the energy company and the affected locality before a drilling permit can be issued, with the standardized RUMA to serve as a starting point for negotiations.[15]

RUMA Requirements

RUMA Process

Ohio legislation requires well operators to have a RUMA in place prior to obtaining the drilling permit. The RUMA is negotiated between the well operator and the county or township in which they will be hauling. In the RUMA, the energy company agrees to improve the road and provide necessary maintenance and repairs. The costs of road improvement projects can range from $50,000 to $3 million. Chesapeake spends an average of $600,000 per project in Ohio.[16]

As part of the RUMA, the energy company must complete an engineering study of the proposed route and an analysis of the impacts of their predicted truck activity. If the road cannot support the expected truck activity, the operator submits a design to the county engineer for the county or township affected. Once the county engineer approves the design, both parties sign the RUMA and the well operator can obtain the drilling permit. However, before drilling can begin, the well operator must complete the specified paving project(s), usually by hiring a contractor. The well operator remains responsible for road maintenance and repairs until activity at the drilling site ceases. The road must be maintained at an equal or greater level than its condition before drilling activity began.[17]

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[13] MacAdam, 2013.
[14] MacAdam, 2013. MacAdam, 2012.
[15] Ibid.
[16] MacAdam, 2013.
[17] Ibid.

One difficulty the state currently faces is that the time it takes to negotiate a RUMA with localities adds on average four weeks to the permitting process. This means that companies must wait an additional four to six weeks before they receive their permit to drill. The state is currently working to streamline the process for negotiating a RUMA between energy companies and local jurisdictions.[18]

Bonding

Bonding is an optional component for RUMAs in Ohio, but is not widely used. Generally, if a company makes upfront improvements, a bond is not required as part of the RUMA. Sometimes smaller energy companies may elect to purchase a bond rather than make improvements to the road because of financial constraints. However, due to the depth of the Utica shale, for the most part only larger companies have been drilling there, and these companies have generally elected to make improvements to the roads. For those companies that do choose to use bonds, they are assessed at $150,000 to $400,000 per mile, depending on the type of road.[19]

Other Aspects of RUMAs

There are other unique aspects to the use of RUMAs in Ohio. One prominent feature is that if an energy company encounters difficulty negotiating an agreement with a local jurisdiction, the company may submit an affidavit substantiating their efforts to reach an agreement and receive a drilling permit from the Ohio Department of Natural Resources (DNR), despite not having reached an agreement with the locality. Negotiations are often more difficult when localities are negotiating their first few RUMAs, as there are substantial road improvements to be made and the local officials are new to the RUMA process.[20] However, even in the few cases where an operator has obtained a drilling permit without establishing a RUMA, the parties have later been able to reach agreement on road improvements.[21]

Another complication occurs when multiple operators use the same route. In these cases, the first company to begin drilling is usually responsible for the improvements. However, the state asks the companies to negotiate amongst themselves the responsibility for future maintenance. Additionally, where a route goes through multiple counties and townships, a separate agreement must be negotiated with each locality.[22]

Results

Ohio considers its use of RUMAs to address the infrastructure impacts of hydraulic fracturing to be a success. To date, 95% of road improvements associated with shale drilling have been paid for by the energy industry through the use of RUMAs.[23] In Carroll County alone there have been 100 RUMAs constituting $40 million of improvements.[24] One factor contributing to the success in Ohio is the cooperation of the energy industry. The state was able to get buy-in from industry by including them in the development process and providing an improvement (a standardized RUMA) on current conditions. Additionally, the energy industry

[18] Ibid.
[19] MacAdam, 2012.
[20] MacAdam, 2013.
[21] Ibid.
[22] Ibid.
[23] MacAdam, 2012.
[24] MacAdam, 2013.

had learned from their experiences in Pennsylvania that upfront road improvements are much more cost-effective, and therefore were willing to discuss doing so in Ohio.[25]

Use of RUMAs in West Virginia

Background on Shale Activity

The Marcellus Shale deposit lies beneath the majority of the state of West Virginia. The first horizontal well in West Virginia was drilled in late 2008. While the West Virginia Department of Transportation (WVDOT) had experience negotiating routes for overweight vehicles with the coal industry, they did not anticipate the infrastructure needs of the energy industry for the development of hydraulic fracturing[26] [27]. The large size of a drill site requires longer routes for the energy companies and these routes are typically traveled for three to four months during the duration of hydraulic fracturing. The size of the equipment, number of trucks, and weight of the loads (particularly the amount of water necessary for the hydraulic fracturing procedure) traversing these routes quickly demonstrated to the WVDOT that changes would be necessary in order for the state to accommodate the needs of both the energy industry and the citizens living along these routes[28].

State Jurisdiction over Roads

The ease with which West Virginia has been able to implement RUMAs is attributable to the fact that WVDOT has authority over all roads in the state. The energy companies are able to work directly with the DOT to negotiate all necessary agreements[29].

History/Development of RUMAs

WVDOT has experience dealing with overweight loads on farm to market and county roads connected with the coal industry. When haulers for the coal companies travel on designated routes, they are required to buy permits that will fund any damages to the roads caused by the overweight vehicles[30]. However, as the hydraulic fracturing procedure began to grow, WVDOT quickly learned that there would be major differences in hauling between the energy and coal industries[31].

Starting in 2010, The West Virginia Department of Transportation began developing a RUMA specific for the energy industry and hydraulic fracturing. The commissioner on gas policy developed several interim programs to try to understand the infrastructure needs of the energy industry. After negotiating a prototype oil and gas policy, the DOT implemented this policy for one year to test its effectiveness. At the conclusion of the trial period, a few necessary changes were made, but the policy has not been significantly altered since that date[32].

[25] MacAdam, 2012.
[26] Holtsclaw et al., 2013.
[27] Smith, 2010.
[28] Holtsclaw et al., 2013.
[29] Ibid.
[30] Smith, 2010.
[31] Holtsclaw et al., 2013.
[32] Ibid.

RUMA Requirements

Energy companies are required to obtain a RUMA that is specific for each of their individual projects. To begin drafting these agreements, the DOT uses a standard RUMA and then negotiates with the companies on each project's specific requirements, such as site access points, hauling routes, and hauling time restrictions. Any other improvements may require separate agreement.

Before a RUMA will be issued, the energy company must identify the major route and specific roads that they will be using for hauling. The energy company then purchases a bond to cover any necessary road repairs that they will incur and the WVDOT issues the company a permit against the bond to travel this route. The energy company must also comply with the environmental regulations before this permit will be issued.

Bonding

West Virginia does require a bond to be purchased before a RUMA will be issued. WVDOT offers two types of bonds: one permitting travel within an individual county and one covering all routes statewide. An individual county bond may be purchased for $250,000 or a statewide bond for $1 million.[33] WVDOT gives no specific formula for calculating these values. While these prices may not be significant to a large energy company, the fact that if a bond is called, the company's entire production statewide is shutdown is where the real leverage lies. If damages assessed exceed $1 million, WVDOT can sue the energy company for the remaining amount of money that they can justify is owed for repairs; energy companies are not capped at $1 million in infrastructure improvement spending.[34] Energy companies must reclaim the drill site (return the site to its original condition, including road repairs and environmental restoration) six months after the last well is drilled.

Other Aspects of RUMAs

West Virginia is unique in that the state DOT requires each energy company to have a representative available at any time in case emergency road repairs are deemed necessary by the DOT. Each WVDOT district has an oil and gas coordinator who works directly with this energy company contact. Energy companies are required to complete any requested emergency road repairs within 24 hours. In speaking with executive representatives from WVDOT, they insist that this relationship is crucial to ensuring smooth working relations between the DOT and energy companies. Each entity knows exactly who to contact if a situation arises that needs to be addressed immediately, avoiding any unnecessary confusion and frustration on both sides[35].

Negotiations are also often necessary between competing energy companies. Frequently, two or more energy companies will utilize the same road(s) for their drilling activity. When arguments arise over which company is responsible for what damages, WVDOT arranges for all energy companies using the road in question to meet and settle the responsibility of payment amongst themselves; WVDOT is usually able to abstain from these talks, but will intervene if the companies are not able to come to an agreement[36].

[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Ibid.

The Marcellus Shale formation spans seven states in the U.S., including West Virginia's neighboring states Pennsylvania and Ohio where much oil production is also taking place[37]. As hydraulic fracturing continues to grow, many states are trying to implement policy to properly regulate this procedure. While these three states have consulted and advised each other on their own effective regulations, differences still remain between each of the states' requirements of the energy companies; these differences can cause confusion and aggravation for the energy companies, especially regarding drill sites that cross state borders. Weight limits, bonding requirements, and various other regulations vary by state, forcing the energy companies and state DOT's to work closely together to ensure that all requirements are met[38].

Results

West Virginia has been able to create and implement RUMAs with minimal legislation, so it will be much easier to make any necessary adjustments to this document through simple negotiations. The energy industry and WVDOT are in agreement that RUMAs have facilitated dealings between the two entities and allowed for simple negotiating procedures.

Corky DeMarco, Executive Director of the West Virginia Oil and Natural Gas Association, stated that the energy industry "quickly learned that [they] are not road builders;" they prefer to pay the DOT and allow them to handle the road repairs or work with the DOT to hire the proper contractor. Many energy companies have contractors on standby to complete any necessary emergency road repairs. Drillers also often set up their own communication system in the field for trucking traffic control; this has allowed for improved safety measures within individual companies and WVDOT as a whole which also has access to these systems[39].

Energy companies have also learned that upfront improvements are cost effective to them in the long run and beneficial for public relations with the communities in which they are working. Because West Virginia is a small state, many individuals who live in these affected communities and along these routes also work for the energy companies. Therefore, citizens, energy company employees, and government workers alike all have a stake in ensuring that these infrastructure repairs are completed in a timely manner[40].

IV. Lessons Learned

In Ohio and West Virginia, the RUMA provides a mechanism by which the state can require the energy industry to address the infrastructure impacts associated with their activities. State and local officials have engaged with the energy sector and faced minimal opposition from industry and the public in the implementation of RUMAs. As a result, the infrastructure needs of the shale industry have been met without placing a significant strain on state or local resources.

Furthermore, in neither state has there been significant public opposition to the use of RUMAs, and the energy companies' willingness to improve the roads has improved their image as good neighbors. The sections below discuss the common factors for success in Ohio and West Virginia, the role the state DOT played in the process, and differences in the use of bonding with RUMAs between the two states.

[37] Moss, 2009.
[38] Holtsclaw et al., 2013.
[39] Ibid.
[40] Ibid.

Common Factors for Success

Ohio and West Virginia have learned similar lessons in addressing infrastructure impacts stemming from the hydraulic fracturing industry's activities. Both states require a RUMA to be in place as part of the well permitting process, which places the burden on industry to come to an agreement before they can begin hydraulic fracturing. An important feature is that RUMAs require energy companies to make road improvements *before* drilling activities begin, unlike in Pennsylvania where Excess Use Maintenance Agreements require repairs after damage has been made. Both energy companies and localities have learned that making these improvements is more cost-effective in the long run, and the willingness of energy companies to make these improvements has helped their image in the local community.

One advantage both states had in implementing RUMAs is energy companies' experiences dealing with road damage in Pennsylvania. In Pennsylvania, the shale industry saw the cost-effectiveness of making upfront road improvements, and they took this lesson with them to Ohio and West Virginia. The two states built on this by engaging with energy companies early on and involving them in the RUMA development process. In both states, early coordination with industry smoothed the process of adapting RUMAs for the shale industry, and allowed the RUMA requirement to be easily enacted in state legislation.

State Road Jurisdiction and Role of the State DOT

However, there are also several key differences between the implementation of RUMAs in Ohio and West Virginia. Most prominently, the authority for roads in the two states defines whether the state or local governments are responsible for negotiating RUMAs. One of the reasons for success in West Virginia is the state's sole jurisdiction over roads, which allows for a single process for obtaining a RUMA. Ohio, a home rule state, has attempted to unify its RUMA process by crafting a standardized document as a starting point for negotiation, even though energy companies must negotiate with individual county or township governments. However, placing the responsibility with local jurisdictions allowed the state DOT to play a facilitation role for the parties involved, which was advantageous in Ohio.

Use of Bonding with RUMAs

Another difference between the two states is the treatment of bonding. West Virginia requires a bond for every RUMA, and considers this feature a key reason for the program's success. Bonding provides a strong incentive for compliance, because should a bond be called in, *all* drilling activities in the county or state (depending on the type of bond) will be halted. In Ohio, on the other hand, local governments rarely make use of the optional bonding requirement. This has been successful because Ohio is working with a small number of larger energy companies. The state reasons that if companies are willing to make upfront improvements, the bonding incentive is unnecessary. The unique features of the shale industry and the road authority in the two states have impacted the nature of the implementation of RUMAs. Should RUMAs be used in Texas, these facets will need to be taken into account.

V. Relevance in Texas

The Eagle Ford Shale formation extends beneath 23 counties in the state of Texas and hydraulic fracturing in the area is growing too quickly to accurately measure the exact number of

wells currently operating within these counties[41]. The problem with this booming industry is that Texas currently has no statewide mandate for negotiating road repair payments from the energy companies. While severance taxes are collected from the sale of oil and natural gas, this money is not directly allocated to finance the infrastructure needs of the energy companies. Because no statewide financing structure is currently in place, counties are organizing coalitions and working together to attempt to obtain funding for road repairs from the Rainy Day Fund[42].

Although oil and natural gas tax revenues do contribute a significant amount of money to the Rainy Day Fund, the fund is not earmarked for infrastructure needs, but rather intended to serve as a safety net to cover any unpredicted budget shortfalls.[43] Furthermore, to allocate money from this fund to serve any purpose other than a budget shortfall requires a two-thirds majority vote.[44] Therefore, with many different interest groups all vying for money from this fund, it is difficult to get the majority of legislators to designate this money for one particular cause[45].

Ultimately, using money from the Rainy Day Fund for road repairs is not sustainable. The energy industry is predicted to continue to grow in the south Texas region where the Eagle Ford Shale is located and also in west Texas where new shale plays are being identified. Statewide measures must be implemented to ensure funding for infrastructure repairs on an ongoing basis (versus a temporary source of funding such as the Rainy Day Fund); money must be available for TxDOT to repair road damages as they are incurred to ensure roadway safety. RUMAs could serve as a financial solution for TxDOT as they enforce that the user pays for the infrastructure they are utilizing.

Most importantly, it is crucial that Texas develop a comprehensive policy for negotiating road repairs between TxDOT and the energy companies. If a statewide policy is not adopted, Texas runs the risk of each individual county creating and implementing their own rules for securing money from the energy companies to finance road repairs, as has happened in Louisiana[46]. While Texas may encounter initial difficulties in negotiating a general RUMA between the many different government entities that oversee roadways within the state, enacting this legislation will ensure that all entities use the same regulations in interactions with energy companies; this will allow for consistent policies across all counties.[47] As evidenced by Ohio and West Virginia's differing requirements regarding hauling regulations, the more policies energy companies have to abide by for different areas, the more frustrating and deterring it can be to the companies. Action must be taken to avoid this problematic situation that could deter development of oil and gas exploration in Texas.

[41] Railroad Commission of Texas, 2013.
[42] Sassin, 2012.
[43] The Texas Tribune, 2013.
[44] Ibid.
[45] Ibid.
[46] Kinchen, 2012.
[47] Hogan, 2013.

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VII. Appendices

Appendix 1: Contacts

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Appendix 2: Websites

County Engineers Association of Ohio
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Ohio Department of Transportation
http://www.ceao.org/aws/CEAO/pt/sp/home_page

Pennsylvania Department of Transportation
http://www.dot.state.pa.us/

Roads for Texas Energy
http://www.roadsfortexasenergy.com/

West Virginia Department of Transportation
http://www.transportation.wv.gov/Pages/default.aspx

West Virginia Department of Transportation, Oil and Gas Policy
http://www.transportation.wv.gov/highways/policies/Documents/OilAndGasPolicy.pdf

West Virginia Oil and Natural Gas Association
http://www.wvonga.com/

Appendix 3: Energy Companies Conducting Horizontal Drilling in Ohio

ANADARKO E & P ONSHORE LLC
ANTERO RES APPALACHIAN CORP
ATLAS NOBLE LLC
CARRIZO (UTICA) LLC
CHESAPEAKE APPALACHIA LLC
CHESAPEAKE EXPLORATION LLC
CHEVRON APPALACHIA LLC
CNX GAS COMPANY LLC
DEVON ENERGY PRODUCTION CO
DEVON ENERGY PRODUCTION CO
ECLIPSE RESOURCES I LP
ENERVEST OPERATING L
EQT PRODUCTION COMPANY
GULFPORT ENERGY CORPORATION
HALCON OPERATING COMPANY INC
HALL DRILLING LLC (OIL & GAS)
HESS OHIO DEVELOPMENTS LLC
HESS OHIO RESOURCES LLC
HG ENERGY LLC
HILCORP ENERGY COMPANY
MOUNTAINEER KEYSTONE LLC
PDC ENERGY INC
PHILLIPS EXPLORATION INC
PROTEGE ENERGY II LLC
R E GAS DEVELOPMENT LLC
SIERRA RESOURCES LLC
STATOIL USA ONSHORE PROP INC
SWEPI LP
TRIAD HUNTER LLC
VIRCO INC
XTO ENERGY INC

Appendix 4: Energy Companies Conducting Horizontal Drilling in West Virginia

AB RESOURCES PA, LLC
ABARTA OIL & GAS COMPANY
ALLIED ENERGY, INC
ANTERO RESOURCES APPALACHIAN CORPORATION
ANTERO RESOURCES BLUESTONE LLC
BASE PETROLEUM, INC
BOWIE INC
BRADY RESOURCES, INC
BRC OPERATING COMPANY, LLC
BUCKEYE OIL PRODUCING CO
CABOT OIL & GAS CORPORATION
CARRIZO (MARCELLUS) WV LLC
CHESAPEAKE APPALACHIA, LLC
CHEVRON APPALACHIA, LLC
CHIEF OIL & GAS, LLC
CNX GAS COMPANY LLC
COLUMBIA GAS TRANSMISSION, LLC
COLUMBIA NATURAL RESOURCES, LLC
CONSOL GAS COMPANY
COW RUN LTD LIABILITY COMPANY
DIVERSIFIED RESOURCES, INC
DOMINION EXPLORATION & PRODUCTION
DURST OIL & GAS CO., INC
EAST RESOURCES, INC
ECOLOGICAL ENERGY INC
ENERGY CORPORATION OF AMERICA
ENERPLUS RESOURCES (USA) CORPORATION
EQT PRODUCTION COMPANY
EXCO RESOURCES (WV), INC
GASTAR EXPLORATION USA, INC
GRENADIER ENERGY PARTNERS, LLC
HALL DRILLING, LLC
HARD ROCK EXPLORATION, INC
HAUGHT ENERGY CORPORATION
HG ENERGY, LLC
HORIZON ENERGY CORPORATION
HUNT MARCELLUS OPERATING COMPANY, LLC
J A & M OIL & GAS COMPANY
JAY-BEE OIL & GAS
MARATHON OIL COMPANY
MOUNTAIN V OIL & GAS, INC
MOUNTAINEER KEYSTONE, LLC
NOBLE ENERGY, INC
NORTHEAST NATURAL ENERGY LLC
NORTHSTAR ENERGY CORPORATION

NOVUS OPERATING, LLC
NYTIS EXPLORATION COMPANY, LLC
P & C OIL & GAS, INC
PDC MOUNTAINEER LLC
PENN VIRGINIA OIL AND GAS CORPORATION
PETROEDGE ENERGY, LLC
PETROEDGE RESOURCES (WV), LLC
PETROLEUM DEVELOPMENT CORPORATION
QUALITY NATURAL GAS, LLC
QUEST EASTERN RESOURCE, LLC
RAM ENERGY RESOURCES (WV)
REED GAS INC
RESERVE OIL & GAS, INC
SACHDEVA ENERGY ENTERPRISES, INC
STALNAKER ENERGY CORPORATION
STATOIL USA ONSHORE PROPERTIES, INC
STONE ENERGY CORPORATION
TERM ENERGY CORP.
TEXAS KEYSTONE INC
TRANS ENERGY, INC
TRANS-CAPITAL INVESTMENT GROUP INC
TRIAD HUNTER, LLC
TRIAD RESOURCES, INC
TRIANA ENERGY, LLC
TUG FORK DEVELOPMENT
VIKING INTERNATIONAL RESOURCES CO. INC
WACO OIL & GAS CO INC
XTO ENERGY, INC
YOST HERITAGE INC

Appendix 5: Ohio Model Roadway Use and Maintenance Agreement for Horizontal Drilling Projects and Infrastructure

MODEL ROADWAY USE AND MAINTENANCE AGREEMENT
FOR HORIZONTAL DRILLING PROJECTS AND INFRASTRUCTURE[48]

THIS AGREEMENT is entered into at _____, Ohio, by and between ___COUNTY / TOWNSHIP___, a political subdivision, whose mailing address is
(hereafter "Authority"), and _____ , whose address is
_____
(Hereafter "Operator"), and shall be as follows:

RECITALS

WHEREAS, Authority has control of the several county/township roads within Township, in _____ County, Ohio and is required by law to keep such roads in good repair; and

WHEREAS, Operator is the operator of certain oil and gas leasehold, and intends to develop and operate the [DEVELOPMENT SITE NAME], including the equipment, facilities, impoundments, and pipelines necessary for the operation of the [DEVELOPMENT SITE NAME] (hereafter collectively referred to as "oil and gas development site") located in _____Township, in _____County, Ohio; and

WHEREAS, Operator intends to commence use of ____miles of CR/TR (_____) and miles of CR/TR (____) for the purpose of ingress to and egress from the [DEVELOPMENT SITE NAME], for traffic necessary for the purpose of constructing sites and drilling horizontal oil and gas wells, and completion operations at the [DEVELOPMENT SITE NAME] (hereinafter referred to collectively as "Drilling Activity"); and

WHEREAS, Authority and Operator desire to enter into an agreement, providing for the repair and maintenance of said roads and bridges thereon as a result of such Drilling Activity; and

WHEREAS, if any county or township roads contemplated herein contain any railroad crossings, Section 4 below shall apply;

NOW THEREFORE, in consideration of the good faith performance by each party of the mutual covenants hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Operator agrees to the maintenance and repair of said roads and bridges, to their pre-Drilling Activity condition or as modified pursuant to Appendix A, thereon for any damages thereto, as a result of Drilling Activity related to such sites.
FURTHER, Operator shall also provide for the strengthening and upgrading of the roads and bridges if mutually agreed to be necessary, prior to or during any Drilling Activity. The areas and structures required to be strengthened and/or upgraded shall be determined by an engineer

[48] County Engineers Association of Ohio, 2012.

provided by the Operator with the approval of the County Engineer to be provided within thirty (30) days of a written request submitted by the Operator. Operator's engineer shall provide a written report to the County detailing the condition of the roads and appurtenances covered under this Agreement along with any recommendations, if necessary.

BOTH PARTIES FURTHER AGREE to the following additional terms and conditions:

1. The portion of CR_____, to be utilized by Operator hereunder, is that exclusive portion beginning at _____*(route description here ending at the intersection of CR/TR*_____. It is understood and agreed that the Operator shall not utilize any of the remainder of CR/TR (____) for any of its Drilling Activities hereunder.

2. The portion of CR/TR (___), to be utilized by Operator hereunder, is that exclusive portion beginning at _____*(the intersection of CR/TR ending at the oil and gas development site)*_____ wherein Operator's site are to be constructed herein. It is understood and agreed that the Operator shall not utilize any of the remainder of CR/TR (____) for any of its Drilling Activities hereunder.

3. Those portions of said roads and bridges and their appurtenances to be used by Operator hereunder and mutually agreed to require necessary strengthening and/or upgrading by the Operator's Engineer in conjunction with the County Engineer, shall be strengthened and/or upgraded to a condition sufficient and adequate to sustain the anticipated Drilling Activity by Operator, at Operator's sole expense, and with the advice and approval of the County Engineer as detailed in Appendix A. Thereafter, such roads shall be maintained by Operator for damages caused by Operator's Drilling Activity, at Operator's sole expense, throughout the term of this Agreement, to a level consistent with the condition of such roads at the commencement of its use by the Operator hereunder or as modified pursuant to Appendix A, as determined by the Operator's engineer and the _____County Engineer. The maintenance of aforementioned roads includes the use of a commercially recognized dust palliative to control the airborne dust created and/or contributed to by the Operator or the Operator's contractors and or agents.

4. The Operator shall give notice to the railroad at least thirty (30) days prior to any known Drilling Activity utilizing a railroad crossing so that a joint inspection can determine the condition of the crossing. Additionally, the Operator shall coordinate all work needing to be performed at a railroad crossing with the railroad company at least thirty (30) days prior to starting work on a railroad crossing. If the railroad company fails to respond to the Operator's notice of work needing to be performed at a railroad crossing within thirty (30) days of receipt of such notice, then the railroad waives all rights it has under this agreement with respect to the work specified in the notice. Work performed at a railroad crossing may include a separate agreement at the railroad's discretion. The Authority shall not be liable for any incidents arising out of or related to work performed at any railroad crossing pursuant to this Agreement or any separate Agreement between the Operator and the railroad company, or lack of notification by Operator.

5. Either the Operator or the Authority may terminate this Agreement with just cause following at least thirty (30) days written notice to the other of its intent to terminate. As soon as possible after receipt of such notice, the Authority and the Operator shall inspect said roads and bridges and their appurtenances. Following final inspection, the parties shall meet, and all restoration resulting from Operator's Drilling Activity shall be identified and thereafter completed by the Operator, at Operator's sole expense. Following completion of all restoration work, this Agreement shall be terminated and of no further force or effect.

6. Unless excepted for the reasons provided below, prior to the Drilling Activity on the Route, Operator shall post a bond or other surety in a form satisfactory to the Authority to cover the costs of any damage caused by the Drilling Activity on the Route by Operator. The amount of the bond or surety shall be in an amount no greater than _____ & 00/100 DOLLARS ($_____.00) per mile. However, no such bond or surety shall be required of Operator, if any of the following conditions are satisfied:

a. A geotechnical analysis of the Route provided by the Operator and mutually accepted by the Authority and Operator exhibits that the Route's condition is sufficient for the expected traffic necessary for the development of the oil and gas development site.
b. The Operator provides a geotechnical analysis of the Route, mutually accepted by the Authority and Operator, and based on that analysis, an Operator and Authority-approved maintenance plan for the Route or an Operator and Authority-approved preventative repair plan of the Route is attached to the Agreement as an addendum.
c. The Operator has provided a sufficient bond or surety, mutually accepted by the Authority and Operator, in favor of the Authority for road usage by the Operator within the Authority's oversight.

7. All motor vehicles to be utilized by Operator hereunder, whether owned by Operator or others, shall comply with all legal size, load and weight limits in accordance with State Law, and all non-conforming vehicles shall require the proper local permit.

8. Operator shall furnish the Authority with a written Letter of Authority, setting forth all necessary contact information, including a twenty four (24) hour emergency contact number, for the authorized local representative of the Operator, and such information shall be maintained and kept current at all times concerned hereunder.

9. If Authority determines that any additional traffic signage is needed, or desired, as a result of this Agreement and in the interests of safety, then Operator shall provide for such signage at Operator's sole expense. In the event that any other safety concerns should arise during the course of this Agreement, Operator and Authority agree that they will mutually discuss such concerns and reach a resolution satisfactory to all concerned.

10. Operator shall protect, save, indemnify, and hold the Authority, its officials and employees harmless from any liability, claims, damages, penalties, charges, or costs which may arise or be claimed as a result of any violations of any laws or ordinances, or any loss, damage or expense, including injury or death to any person, from any cause or causes from Drilling Activity whatsoever.

11. Operator assumes all liability for subcontractors and or agents working on Operator's behalf.

12. This Agreement shall be binding upon Operator and Authority, and their respective successors and assigns.

13. In any event that any clause, provision or remedy in this Agreement shall, for any reason, be deemed invalid or unenforceable, the remaining clauses and provisions shall not be affected, impaired or invalidated and shall remain in full force and effect.

14. Agreement shall be governed by the laws of the State of Ohio.

15. This Agreement shall be in effect on , 201 ___.

Executed in duplicate on the dates set forth below.

Authority	Operator
By:	By:
Commissioner/Trustee	
By:	Printed name:
Commissioner/Trustee	
By:	Company Name:
Commissioner/Trustee	
By:	Title:
County Engineer	
Dated:	Dated:

Approved as to Form:

County Prosecutor

SAMPLE
Appendix A

Operator shall be required to:

1) Provide for videotaping of the road prior to Drilling Activity.
2) Provide an engineering report detailing pavement thickness and composition, base thickness and composition, and subgrade composition, as and if reasonably determinable. Engineering report to also provide an analysis of conditions along with a recommendation, if mutually agreed to be necessary, for upgrading roadway to handle anticipated Drilling Activity.
3) Upgrade CR/TR in accordance with the attached plans and/or county standards, dated 10/10/11.
4) Maintain CR/TR during Drilling Activities for those damages caused by said Drilling Activities.
5) Reimburse the Authority for minor maintenance of the road during the hauling period (or provide for a contractor to perform minor maintenance on 24 hour notice) for damages caused by Drilling Activities.

Authority shall:

1) Provide for minor maintenance of the road during the Drilling Activity for damages not caused by said Drilling Activity. For any work that is to be reimbursed by the Operator to the Authority, Authority agrees to give 24 hour prior notice to the Operator (or agrees to notify Operator when maintenance is needed).
2) Provide for maintenance of the roadway and bridges for damages not caused by the Drilling Activity at the Authority's cost and expense, including snow/ice control, mowing, etc.

The intent of this Appendix A is to include anything agreed to by the parties –If the Authority wants plans prior to construction, then include – etc., etc. If the Authority doesn't want anything in Appendix A, then that is their option.

The parties could also address the scenario where more than one Operator is involved on the same Route in this appendix.

Appendix 6. West Virginia Example Road Use Maintenance Agreement

OIL AND GAS ROAD
STATEWIDE BONDING AGREEMENT[49]

THIS AGREEMENT, executed in duplicate, made and entered into this ____ day of _____, 2012, by and between the **WEST VIRGINIA DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS**, hereinafter called "**DEPARTMENT**," and_____, _____company, hereinafter called "**COMPANY**."

WITNESSETH:

WHEREAS, Company has horizontal gas well drilling operations in certain areas of West Virginia; and

WHEREAS, the Department believes that the frequent and repetitive use of certain sections of highways in the State by Company, its contractors, agents, independent contractors or suppliers of drilling materials or drilling equipment, and employees contributes to increased wear and tear to public roads in the state road system in the State , including local roads ("State Owned Roads"); and,

WHEREAS, the Department and Company have entered into this Agreement to satisfy the requirements of the Department's policy entitled "Oil & Gas Road Policy" dated January 3, 2012, as issued by Paul A. Mattox, Jr., Secretary of Transportation / Commissioner of Highways, and any subsequent related policies, hereinafter called "Policy", a copy of which is made a part of this Bonding Agreement and is identified as Attachment 1.

NOW, THEREFORE, for and in consideration of the mutual agreements hereinafter set forth, the parties agree as follows:

I. For purposes of this Bonding Agreement, "Project Transportation Usage" of the Company shall be understood to mean use of one or more State Owned Roads for the delivery and removal of drilling materials and drilling equipment at the site or location of one or more of Company's horizontal gas well pad locations. To the extent reasonably practical, prior to commencing use of a State Owned Road for Project Transportation Usage after January 1, 2011, the Company shall submit to the Department a section or sections of current official WVDOH County Highway maps identifying the exact location of the proposed project and the State Owned Roads that the Company will utilize for the Project Transportation Usage.

II. Company and Department shall within 14 days of the Company's submittal, agree to a list of these sections of State Owned Roads, hereinafter called "Project Roads List", to be utilized for each of Company's projects, identified by route number and milepost; at a time to be mutually agreed to by the parties prior to initial commencement of Project

[49] West Virginia Department of Transportation, 2013.

Transportation Usage of a particular State Owned Road on a Project Roads List, the Company and Department will jointly review the condition of the roads and bridges on the Project Roads List. The Department will document the road type and surface condition and general right-of-way width of each section of road on the Project Road List. Either party may supplement this documentation with photographs, video or other evidence of the present condition of the road surface, shoulders, ditches, culverts, bridges or other structures or appurtenances of roads on the Project Road List, as well as approaches to the roads, utility facilities located within or along the right-of-way, or any other condition, including third-party activities, that may affect the duties and responsibilities of the parties under this Agreement. A copy of any such documentation must be made and provided to the other party within ten business days after the joint review of the roads on the Project Roads List.

III. Department shall issue a Project Agreement or Project Permit, as appropriate, to Company to use State Owned Roads and may include any minor or major improvements required of Company prior to, during or after Project with the assignment of responsibilities of both parties prior to, during and after the operator has completed well fracturing.

IV. In the Project Agreement/Project Permit, the Department shall not require the use of State Owned Roads other than the roads proposed by Company unless the Department has safety concerns as to the Company's proposed roads. A failure to agree on roads that may otherwise be lawfully used for a particular Project Transportation Usage shall result in the designation of the State Owned Roads proposed by Company, with milepost determinations as designated by Department. This Agreement shall only cover portions of State Owned Roads designated on the Project Roads List.

V. For the duration of Company's Project Transportation Usage of the Stated Owned Roads on the Project Roads List, whether by the Company, its contractors (while working on behalf of Company), agents, independent contractors or suppliers of drilling materials or drilling equipment, or employees, the Company agrees to pay for all reasonable maintenance and repair costs incurred by the Department to repair areas of the State Owned Roads included in the Project Roads List that were directly damaged by Company's Project Transportation Usage, as determined to be reasonably necessary and appropriate by the Department. The Department shall keep a record of all labor performed by Department employees and contractors for such maintenance and repairs and shall send an invoice for the same to Company.

VI. Company shall be responsible for the cost of all maintenance and repairs reasonably necessary to put the existing roadways, bridges and appurtenances on the Project Roads List utilized for the Project Transportation Usage in the condition that existed immediately prior to the Project Transportation Usage. Company shall not be required to pay for maintenance or repairs to put any areas of such roadways, bridges and appurtenances on the Project Roads List in a condition better than the condition that existed immediately prior to the Project Transportation Usage. Company shall also not be required to pay for maintenance or repairs to any areas of these roadways, bridges or appurtenances on the

Project Roads List that are not actually utilized for the Project Transportation Usage or for damage not caused by Project Transportation Usage.

VII. Company shall notify the Department in writing of Company's final completion of Project Transportation Usage for particular roadways, bridges and appurtenances on the Project Roads List. Within fourteen days after its receipt of written notification of the completion of the Project Transportation Usage for all roads on a Project Roads List, the Department will review the condition of the roadways, bridges and appurtenances on the Project Roads List actually utilized for the Project Transportation Usage and advise Company of any final repairs reasonably necessary to leave these roads, bridges and appurtenances in a condition reasonably deemed by Department to be equal to their condition prior to commencement of Project Transportation Usage; and, upon completion of all such final repairs by or on behalf of Company and acceptance by Department, the Company shall be released from all further liability for maintenance or repairs to roads, bridges, or appurtenances on said Project Roads List. Any maintenance or repair work under the Project Agreement/Project Permit for roads, bridges or appurtenances on the Project Roads List may be performed by a contractor directly chosen by the Company as approved by the Department, the Department's workforce, or a private contractor hired by the Department through the public bid process in accordance with state law, all of which work shall be subject to the standards and specifications of the Department.

VIII. In order to ensure performance of Company's performance and payment obligations under this Bonding Agreement, the Company shall post a corporate surety bond, hereinafter called "**Master Bond**", with the Department named as the beneficiary, which form of bond shall be subject to the consent of the Department, not to be unreasonably withheld. The amount and form of the bond shall be in accordance with the Policy as set forth above. However, the amount of the Master Bond does not limit the amount of claims that may be made by the Department against the Company under this Bonding Agreement. The Company shall provide the Master Bond to the Department within one (1) month after the execution of this Bonding Agreement. The Master Bond shall secure the good faith performance of all payment obligations of Company under the terms of this Bonding Agreement respecting the roads, bridges and appurtenances on the Project Roads List for each Project Transportation Usage undertaken by the Company, and shall remain in effect until termination of this Agreement. Company shall not be obligated to provide any other bonds, sureties, or other guarantees of performance to the Department for Company's use of State Owned Roads, except as required in this Agreement.

IX. Company shall maintain Commercial General Liability Insurance in the amount of two million dollars, with a minimum coverage of one million dollars per occurrence, for personal injury or death to persons, or for property damage, resulting from Company's Project Transportation Usage and shall present evidence of such insurance to Department upon request.

X. Company's usage of State Owned Roads under the Project Agreement/Project Permit shall comply with all applicable Federal, State and local laws and regulations including, but not limited to, to the extent applicable, the National Environmental Policy Act, Section 404 of

the Clean Water Act, Section 106 of the National Historic Preservation Act, Rare, Threatened and Endangered Species Act, Section 401 Water Quality Certification, and hazardous waste requirements. Further, upon reasonable written request of Department, Company shall furnish Department with acceptable documentation of such compliance which is in the possession of the Company.

XI. Company shall defend, indemnify and hold Department harmless from and against any and all losses, damage, and liability, and from all claims for damages on account of or by reason of bodily injury, including death, which may be sustained, or claimed to be sustained, by any person or persons, including employees of Department, and from and against any and all claims, losses or liabilities for damages to property, arising out of the negligent or willful acts or omissions of Company, its agents, independent contractors and suppliers of drilling materials or drilling equipment, employees and contractors, in the performance of all Project Transportation Usage activities undertaken pursuant to this Agreement (collectively, "claims"). The Company shall not be responsible to indemnify, defend or hold harmless Department for any claims caused by the negligent or willful acts or omissions of the Department or its agents, employees and contractors or third parties not performing work at the direction of Company or delivering drilling equipment or drilling materials, including water, for use by or for company.

XII. If a provision of this Agreement is or becomes illegal, invalid or unenforceable in any jurisdiction, that shall not affect the validity or enforceability of any other provision of this Agreement; or the validity or enforceability in other jurisdictions of that or any other provision of this Agreement.

Department shall give Company a minimum of thirty days written notice of default under the terms of this Bonding Agreement and the opportunity to cure this default during such thirty-day period. If a default is not cured to the satisfaction of Department, or provision acceptable to Department is not made for a cure, Department may then elect to terminate this Bonding Agreement in whole or in part, and may in addition exercise its rights under the Master Bond or seek any other lawful relief available. Company may terminate this Bonding Agreement upon thirty days written notice to Department for any reason. In the event Company terminates this Agreement for any reason, it shall be liable for the repair and maintenance costs set forth above for prior Project Transportation Usage.

XIII. Nothing herein shall be construed to mean that Company shall have any jurisdiction or control over any public roads in the state road system.

XIV. Company, its contractors, agents, employees and suppliers shall at all times be subject to applicable provisions of state and federal law, including without limitation laws requiring operation of vehicles in accordance with legal size and weight restrictions and posted weight limits. Oversize/overweight permits for vehicle or loads not otherwise conforming with law must be obtained in accordance with law; Department agrees to work in good faith with Company to review and grant (where authorized by law) such permits in a timely manner upon request by Company.

XV. This Bonding Agreement shall be construed and enforced in accordance with the laws of the State of West Virginia, as they may be amended.

XVI. This Bonding Agreement shall be binding upon the successors and assigns of each party hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Bonding Agreement to be executed by their duly authorized officers effective as of the date first above written.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION,
DIVISION OF HIGHWAYS

_____ By: _____
Witness State Highway Engineer

_____,

_____ By: _____
Witness
Title: _____

(To be executed in duplicate)

Availability Payment Public Private Partnerships

I. Executive Summary

The Texas Department of Transportation's (TxDOT) use of Public-Private Partnerships (P3s) to finance highways has served as a useful tool in financing the state's transportation projects. As TxDOT reaches its debt limit[50], its ability to raise money for large projects will be constrained and it will have to rely more on innovative P3 financings. We examined the experiences of states such as Florida, California, and Indiana, which have been in the forefront of using P3s, and identified availability payments as offering a suitable P3 option that is currently not employed in Texas. Under an availability payment arrangement, a concessionaire builds, finances, operates, and maintains a road. In exchange, TxDOT would agree to make annual payments to the concessionaire to compensate the firm for building the road. TxDOT would open this process up to competition by soliciting bids in which each proposing firm would lay out its design plans and the annual payments the concessionaire would require in exchange for building, financing, and maintaining the road.

The annual payments by TxDOT are subject to legislative budget appropriation, which involves some level of risk to the concessionaire.[51] However, this revenue is perceived as less risky than the revenue resulting from toll revenue. From the concessionaire's point of view, the appropriations are perceived as "predictable cash flow"[52] despite the risk that the legislature could choose not to appropriate the availability payment in the future.

Current statutes do not allow TxDOT to enter into availability payment financing agreements. Yet this option has been used extensively internationally and has recently emerged as an alternative way of financing large scale projects in the U.S. Several large projects have been financed using this method in Florida, California, Ohio, and Indiana. In Florida's I-595 project, which is the focus of this paper, the Florida Department of Transportation (FDOT) determined that this method would be the least expensive way of delivering the project while at the same time relieving itself from the financing, construction, and operations risk inherent in road construction by transferring them to the concessionaire.

II. Background

As previously mentioned, availability payment financings are suitable in instances where toll revenue alone is insufficient to repay the road's financing costs and where financing the road with the State's debt would severely limit or exceed the State's debt capacity. Since availability payments are subject to ongoing legislative appropriation, the annual payments do not count against the state's debt limit.[53] Availability payment structures provide several benefits, including the ability to accelerate the project and transfer a number of risks to the concessionaire, including financing, construction, operations, and maintenance risks. This risk transfer, particularly through the concessionaire's upfront financing of the project, may tilt the scale in favor of availability payment programs over other procurement methods where the State issues its own debt and retains some of above-mentioned risks. It may also be a less expensive way to

[50] Dickson, 2012.
[51] Shields, 2012.
[52] Engel et al, 2010.
[53] Minnesota DOT, 2013.

build and maintain projects. For example, using a value-for-money analysis, Florida determined that this financing method for I-595 was cheaper[54] than alternatives considered and achieved the societal goal of increasing traffic volume. In addition to these fiduciary innovations, FDOT incorporated a variety of community outreach techniques and panels from the start of the project that continue into the present day. The community outreach techniques were incorporated in order to shepherd the transition from purely non-tolled thoroughfares to a public tolling system and incorporate public input into the construction planning and community impact assessment.

Experience in the United States

Availability payment financings are emerging as an innovative way to finance highways in the US. As shown in Table 1, three states, Florida,[55] California,[56] and Indiana[57], have already implemented availability payment programs and a number of other states, including Ohio[58], are considering them and have begun setting standard operating procedures regulating their use.

Table 1. State use of availability payments

State	Projects	Tolls
Florida	Port of Miami Tunnel	No Tolls Charged
	I-595 Corridor	Managed Tolls on 3 of 19 lanes
California	Presidio Parkway	No Tolls Charged
Ohio	None, but Standard Operating Procedures are in place	—
Indiana	Ohio River Bridge	Tolls Charged

Currently, only the Florida I-595 and the Ohio River Bridge project incorporate a toll charge, making these the most relevant to the goal of reducing the reliance on taxes as the sole source of funding for highways. Since this financing method has only recently been employed as an option in the US, there are only a few examples from which to draw from.

International Experience

The international experience contains more examples of roads financed with availability payments, particularly in the UK, Portugal, Spain, and Australia. The UK's experience with availability models provided rich experience on the development P3 from early Design, Build, Finance, and Operate (DBFO) arrangements to the availability models used today. In the UK, the Highway Agency has been playing a leading role in using P3 to improve road maintenance, mostly through its DBFO form of contract. The DBFO program was first launched in 1994 and began with eight contracts in 1996. In utilizing P3, the Highway Agency benefited from early

[54] Jeffrey A. Parker & Associates, 2009.
[55] Federal Highway Administration I-595, 2013.
[56] Federal Highway Administration Presidio Parkway, 2013.
[57] Devitt, 2013.
[58] Ohio Department of Transportation, 2013.

delivery of new projects, efficient operation, controlled cost and risk, stimulated innovation, good quality, and better value for money. Evidence from the construction of public buildings suggests that by using P3, "only 22 percent of public building projects had exceeded the cost expected by the public sector at contract award. This is a dramatic improvement compared with a previous survey of public building projects in 1999 which found that 73 percent had overshot the cost expected by the public sector."[59]

The initial eight availability payment contracts were designed to be a Shadow Toll Payment[60] mechanism with a prospect of developing into real toll roads. The A13 Thames Gateway project, which was the ninth DBFO project awarded in 2000, involved a congested urban route. In order to serve this road condition, an innovative way of relating payment to the service was designed, i.e., an "availability" mechanism; under this mechanism, payment would be made in full when the road was fully available for use. If any part of the road was out of service, then the payment would be deducted accordingly. This innovation was the first of its kind in the world and effectively stimulated the active management of the road.

The UK's availability payment mechanism combined various factors in its payment mechanism including congestion, lane availability, safety, etc. Currently, due to the large amount of government debt, the UK government plans to further develop this payment mechanism. In late November 2011, the UK Treasury announced its intention to use toll-based concessions and explored alternative sources of funding, including UK pension funds.[61]

Portugal began using P3 concessions as early as 1972. Since then, the country has built its National Motorway System largely utilizing P3 financing mechanisms. Portugal initiated the availability payment mechanism in the 1990s with the payment delivered according to the key criteria: lane availability, route performance, safety performance, unplanned events, active management, etc.[62] However, the path developed by Portugal also shows that availability payments are not a risk-free mechanism, even if it shifts performance risks largely to the private sector. Since 2010, the Portuguese government has begun to convert its shadow toll roads to real toll roads for availability payment concessions, after it realized the debt may not be affordable—the projections in 2006 showed that the debt may reach $1 billion in 2009.[63] In September 2011, *Infrastructure Investor*, a magazine focusing on global infrastructure finance and investment, released a report about Portugal's road agency may default by 2014.[64]

III. Key Policy Issues

TxDOT Financing Tools

In Texas, P3 arrangements are governed by legislation authorizing Comprehensive Development Agreements (CDAs), which TxDOT has actively employed as a project delivery tool since it signed the first agreement in June 2002.[65] Since then, TxDOT has used its CDA authority to enter into agreements ranging from traditional design-build arrangements to more

[59] National Audit Office, 2003.
[60] In shadow toll financings, the driver is not charged a toll. Instead, the government agency pays the toll to the concessionaire based on the road's usage, usually measured in the number of vehicle miles traveled.
[61] Poole, 2012.
[62] US Department of Transportation, 2009.
[63] Poole, 2010.
[64] Infrastructure Investor, 2011.
[65] TxDOT CDA, 2013.

innovative full concessions, where the concessionaire builds and finances the road in exchange for the right to set and collect tolls.

However, unlike other states such as Florida and California, TxDOT has not employed the P3 availability payment model for large projects under its CDA authority. Part of the reason is that "current statutes do not clearly provide for the use of availability [payments]"[66] In an availability payment structure, TxDOT would commit to making milestone and pre-set annual availability payments to a concessionaire in return for having the concessionaire design, build, finance, operate, and maintain (DBFOM) a road. To offset part or all of the availability payment, the Department could charge a toll for the use of the road. Under this procurement method, TxDOT would retain all of the traffic and revenue risk; this feature is a potential drawback, but it also allows TxDOT to develop projects for roads whose toll revenue alone would be insufficient to support the road's financial viability.[67] On the other hand, the state also would retain full rights to the toll revenue, which could be substantial if the toll road induced enough nearby investment, which, in turn, would increase traffic flows.

To be clear, the State has used a variation of this financing mechanism with its Pass-Through agreements. TxDOT has entered into several Pass-Through agreements, but mostly for a "handful of smaller, free roads."[68] In Pass-Through financing, TxDOT commits to making annual payments to the developer or local government that finances and builds the road, and begins making payments only after the road is open to traffic. In this sense, the Pass-Through program is very similar to an availability payment structure. Unlike the availability payment model, where the expected availability payment is not based on traffic, payments under the pass-through agreement are based on the number of vehicle miles traveled on the road, subject to a minimum and maximum limit. As such, the Pass-Through model succeeds in assigning some of the traffic risk to the developer or local government, though this risk is mitigated by TxDOT's guarantee of a minimum annual payment.

I-595 Case Study: Benefits of Availability Payment Financing Method

The use of availability payments to finance road projects has been used widely in the UK, but only a handful of projects have been completed in the U.S. Most of these have reached financial close and are still under construction, so that the direct benefits, including toll revenue and congestion relief, are not yet measurable. However, the provisions in each project's financing structure allow for some interesting comparisons. One of the main differences between availability payment projects is whether the financing plan includes the use of tolls to help offset the DOT's availability payments to the concessionaire. Two major projects, the Port of Miami Tunnel in Florida and Presidio Parkway in California, have opted not to use tolls, in part because the goal is to increase throughput rather than to maximize revenue. This is especially true of the Port of Miami tunnel project whose primary goal is to reduce congestion—especially from truck traffic originating from the port—in downtown Miami.[69]

On the other hand, the $1.68 billion I-595 Expressway project in Florida will use tolls. The project will include three reversible managed toll lanes and sixteen non-tolled lanes that span a 10.5 mile segment. This model appears to be the most promising as it combines tolls (user fees), which partially offset the cost of the availability payment, while also achieving the societal

[66] TxDOT Educational Series, 2013.
[67] AASHTO, 2013.
[68] Lindenberger, 2009.
[69] Port of Miami Tunnel, 2013.

goals of increasing throughput and accelerating the construction of projects that would otherwise be delayed due to funding shortfalls.

This model also holds the promise of being the least expensive in present value terms compared to alternatives described below. In June 2009, the Florida Department of Transportation conducted a Value for Money Analysis on the I-595 Corridor Improvements in which it outlined the rationale for selecting the availability payment project delivery method.[70] Among the reasons cited for selecting this method were that toll revenues alone were insufficient to cover the project's capital costs and that FDOT intended to transfer "lifecycle cost and long-term operations and maintenance responsibilities."[71] FDOT also compared the present value costs of the payments FDOT would have to make under three different procurement scenarios: 1) concession availability payments, 2) concession shadow tolls, and 3) design-build-finance. Table 2 shows the result of that comparison.

Table 2. Finance method – cost comparison

Figures in Millions of 2007 Dollars	Concession Availability Payments	Concession Shadow Tolls	DBF
Net Present Cost	$1,896	$2,040	$2,000

FDOT found that the concession availability payments structure was the cheapest option in present value terms. The lower present value cost was achieved despite having to pay a higher interest rate associated with the taxable loan (relative to the tax-exempt bonds private activity bonds that would have been available to the concessionaire) and 11.5%[72] internal rate of return requirement on the $208 million equity contribution. This seemingly paradoxical statement can be reconciled with two additional facts. First, the availability payment structure turns out to be cheaper in part because the DBF scenario includes a 5% risk contingency and a 5% construction cost overrun line item.[73] The availability payment assumptions do not include those two sizeable items, as those would be risks assumed by the availability payment concessionaire.[74] Second, a value for money analysis "relies on more than the cost of capital."[75] As Regan explains:

> In the bid evaluation process, the state will not have access to the innovation, technology, incentives or efficiencies available to private consortia and the collective effect of these benefits is to outweigh the disadvantage of a higher private cost of capital and the requirements for private investors to make a market return.[76]

This analytic approach, which includes the cost of renewal and replacement of the facility under all three scenarios, presents a means of calculating the true cost of building and maintaining a highway over the entirety of its functional lifespan and it ensures that the resulting comparison of costs is accurate.

[70] Jeffrey A. Parker & Associates, 2009.
[71] Ibid.
[72] Ibid.
[73] Ibid.
[74] Ibid.
[75] Regan, 2009.
[76] Regan, 2009:22.

One of the most noteworthy aspects of the I-595 project was that availability financing was able to attract enough investor interest to continue the project despite the serious market upheaval that began in September 2008. Only a month after the start of the financial crisis, in October 2008, FDOT chose Spanish developer ACS Infrastructure as the preferred bidder for the project. In its project bid submission, ACS assumed that it would be able to finance a large part of the project with $826 million in a tax-exempt private activity bond (PAB) allocation that FDOT had already secured from the U.S. Department of Transportation. However, the financial collapse of 2008 restricted access to the capital markets and initially placed the financing of the project in severe jeopardy. Despite this setback, ACS was able to place nearly $800 million in senior debt with a group of 12 private banks and close on March 3, 2009. The successful placement of the debt in that environment provided a strong signal of investor confidence in a 35-year agreement for which there was appropriation risk and proved that this financing could be feasible even in the absence of traditional sources of funding.

Public Involvement

I-595 was built in 1989. Until the P3 component was formed in 2009, the highway was not tolled, fomenting a need to expose the public to the necessity of tolling as a prerequisite for additional roadway construction. The governmental stance was clear: the construction of new roads would necessarily be financed through public-private-partnerships. As State Representative Lake Ray states, there was a "stark choice: build new lanes with tolls or don't build at all."[77] The second of these options became increasingly untenable, as the rate of growth on I-595 became unmanageable without further development; traffic was projected to increase from 180,000 road users per day to 300,000 by 2034.[78]

In addition to the public relations difficulties of creating toll-related funding options for the expansion of an already-existent highway, the enormous expense and trailblazing nature of this $1.685 billion project meant that outreach to the general public was essential. The first step of FDOT's dialogue with the general public occurred during the Public Development and Environmental Study (PD&E) in 2004.[79] The purpose of the research was to assess the feasibility of logistical development along the twelve miles of the corridor. In 2005, FDOT extended its outreach via a series of public hearings which involved government regulatory agencies, legislatures, and workshops, as well as different project development stakeholders. These hearings were held under the Public Involvement Program (PIP), which was part of the PD&E during the construction phase of the project. The PD &E fostered a step-by-step approach combined with timeline evaluations.[80]

As the project unfurled, FDOT, in a joint venture with the Concessionaire, created a Community Awareness Plan (CAP) under the PIP. The CAP was created to function as a "living document[81]" open to the general public and media. Designated communication project events, dates, and modifications to the CAP were and continue to be disseminated and updated regularly. This communication is done mainly through the I-595 website portal via an interactive segment-based map. This allows the general public to locate active work zones, view live traffic updates,

[77] Hannan, 2012.
[78] I-595 Express, 2009.
[79] I-595 Express, 2012.
[80] Florida Department of Transportation, 2009.
[81] Community Awareness Plan, 2006.

access collection of media highlights and brochures, and even participate in stakeholder surveys of satisfaction with the website itself.

The latest step in the outreach process, under the CAP, is the Community Awareness Committee (CAC). The CAC consists of town officials, town engineers, construction managers, and the general public and meets quarterly in order to address community concerns about construction issues before they become a problem.[82] The most pertinent example of the effectiveness of this committee is the creation of 13 noise barriers for the surrounding 20 communities in the region, in response to community concerns.

IV. Lessons Learned

FDOT's decision to use a DBFOM model versus that of a traditional tolling model was predicated on the prioritization of efficiency. The efficiency criterion is best described in the Value of Money document for I-595, "FDOT determined it could deliver the capacity improvements approximately 15 years earlier, than under traditional pay-as-you-go procurements."[83] The use of the DBFOM shortened the construction time from fifteen to five years. Overall, as a Public Relations Officer from the I-595 project notes,

> This was a huge construction project...as you can imagine financing something like that is a big undertaking and well as building it is a massive undertaking. So instead of doing it in a traditional sense they selected to use a [P3] contract. In order to finance it was privately funded and then FDOT then has a 30 year maintenance contract with concessionaire. That way it won't take twenty years to build it.[84]

This act also took the public into consideration through its shortening of construction delays.

Secondly, FDOT addressed the public concern that the toll concessionaire will raise tolls excessively to maximize revenue. FDOT did this by taking on the toll revenue risk from the concessionaire, in exchange for the government to be able to maintain control of toll rates. It is quite plausible that due to the relatively low price elasticity of road users, if the concessionaire had been allowed to set toll rates, this could have led to "on the express lanes, higher tolls than necessary to achieve free flow could result in greater revenue but lower utilization."[85] Clearly, a situation where the concessionaire has an incentive to profit from increasing toll rates excessively "would not be aligned with FDOT's goal of relieving congestion on all lanes at the lowest cost to the public."[86] Furthermore, the public is more accepting of a P3 structure where the state's DOT sets and collects tolls, rather than a concessionaire doing this. In sum, FDOT's decision removed the potential for underutilization of the toll road due to the private entities' need for profit maximization.

V. Relevance to Texas

According to its own publications, TxDOT does not have the express authority to enter into availability payment P3 financing structures. However, an availability payment model might

[82] Sokol, 2012.
[83] Jeffrey A. Parker & Associates, 2009.
[84] Sokol, 2012.
[85] Jeffrey A. Parker & Associates, 2009.
[86] Ibid.

be a useful option because of the number of benefits that this type of project delivery method confers. The first is that the availability payment model increases TxDOT's ability to construct or expand roads by soliciting up-front private funds to finance construction. This is especially important as TxDOT reaches it limit on bonding capacity. In addition, the availability payment model transfers the design, build, and financing risk to the concessionaire; in exchange, the DOT retains the revenue risk from tolls. In other words, TxDOT does not have to make payments for the road until it is available for use, and can suspend or lower the annual payments if the road does not meet certain quality or performance specifications. This ensures that the concessionaire will have an incentive to build and maintain the road so that the risk of lane closures is minimized. Finally, the availability payment model addresses one of the main issues raised by opponents of private involvement in toll roads; namely, that private firms will reap huge profits by raising tolls to exorbitantly high levels. Under an availability payment structure, the state sets and collects tolls, and the private firm's profit is capped by the maximum annual payment bid submitted in the development proposal.

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VII. Appendix

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I-595 Express Corridor Concession Agreement
http://www.i-595.com/About-Documents.asp

Florida P3 Statute
http://www.flsenate.gov/laws/statutes/2011/334.30

Electric Vehicle Fees

I. Executive Summary

In 2012/2013 legislative sessions, several states considered bills including new or modified fees imposed on electric, hybrid, or alternative fueled vehicles.[87] As the fleet of newer vehicles with increased fuel efficiency and alternative fuel sources continues to grow, the main source of transportation revenue for the state, the gas tax, loses efficacy and adequacy. Washington State passed legislation in 2012 (House Bill 2660) requiring all electric vehicles to pay an additional $100 fee at the time of registration.[88] In 2013, Virginia passed a comprehensive transportation funding bill (House Bill 2313) including a requirement for all electric, hybrid, and alternative fuel vehicles to pay a $64 registration fee.[89]

Electric vehicle (EV[90]) fees provide the first step towards charging vehicles based on road use rather than fuel consumption. While the gas tax originally functioned as a user fee, the increasing disparity between needs and the growing fuel efficiency of passenger vehicles weakens the correlation between the gas tax and road use. On the other hand, EV fees have the potential to capture the effects of technology in modern vehicles, and their structure may better capture vehicle consumption of roads. However, no existing studies found in the course of this research provide sufficient background or support for any given fee level. The EV fee rates adopted in Washington State and Virginia were generated primarily through legislative deliberations.[91] [92]

EV fees, as adopted in these states, are levied annually on purely electric vehicles at the time of registration. Typically, only vehicles that travel over a given threshold speed (example: 35 mph) are subject to the fee.[93] Because electric vehicle users forego paying gas tax, they do not pay for their road usage. Realizing the inadequacy of the gas tax for certain vehicles, many states have explored charges on hybrids and alternative vehicles as well as EV's as a source of revenue and a bridge to future funding mechanisms.

To calculate an appropriate fee for vehicle owners, the Texas Department of Transportation (TxDOT) must first identify their goal in imposing a fee that

1) Completely recovers foregone gas tax revenues from purely electric vehicles;

2) Recovers foregone gas tax revenue from electric vehicles and other hybrids and alternatively fueled vehicles; and

3) Recovers the full annual cost of road usage for an electric vehicle.

This policy brief evaluates the Washington State and Virginia fees in relation to the first goal and proposes four methods that may be used as starting points for each goal. The fee level

[87] National Conference of State Legislatures, 2013.
[88] "HB2660, 2013.
[89] "HB 2313 Revenues," 2013.
[90] For purpose of this brief, EVs refer to plug-in electric vehicles, also called PEVs
[91] George Hoffer, 2013.
[92] Ben Shomshor, 2013.
[93] Phuong Le, 2013.

should be based both on the policy goals, and policymakers' considerations of existing and desired incentives and disincentives for electric vehicle use.

A number of factors contribute to decreasing gas tax revenue, including new Obama administration fuel efficiency standards and no correlation of gas tax to inflation.[94] Additionally, electric vehicles and alternatively fueled vehicles are becoming more popular with market share expected to increase. Initiating a new fee oriented toward road usage while EV take-up is still relatively low allows policymakers to institute a change without placing an extensive burden on a large number of citizens.

II. Background

New sources of transportation funding are necessary in Texas due to declining revenue from the gas tax, compounded by pressure from an increasing population and aging infrastructure. In Texas, the gas tax has remained unchanged at 20¢ per gallon since 1991, with 5¢ dedicated to education.[95] Since 1991, the purchasing power of those 20¢ has decreased as a result of inflation.[96] Between 1991 and 2009, average fuel efficiency in Texas increased from 17 miles per gallon (mpg) to 20.5 mpg, or 20.6%.[97] In comparison, average US fuel economy was 23.5 mpg.[98]

Market projections from Navigant Research indicate the EV market is expected to grow quickly in coming years.[99] In addition to a general improvement in fuel economy, electric, hybrid, and alternative fueled vehicles represent a trend towards non-gasoline-powered automobiles. This change necessitates an alternative form of funding less reliant on the gas tax and not in danger of obsolescence in the near future.

Looking at recent state legislative action throughout the country, the introduction of registration fees on electric and other vehicles holds potential. Both Washington State and Virginia have passed legislation including annual registration fees on electric vehicles in recent years. Fees offer an alternative to tax increases and provide momentum toward use-based fees. A use-based fee is a charge levied based on the distance driven and/or road damage as opposed to fuel consumption.

Presently, minimal calculations are available to compare current gas tax expenditures per capita with potential electric or hybrid vehicle savings. Benefits and costs of different proposed models can be partially addressed based on several indicators. These indicators include an evaluation of parity between different types of vehicles, the relative success at replacing the gas tax, an ability to generate revenue (present and future), an assessment of the fee as a usage charge, and how the fee might impact the ability to incentivize more efficient vehicles. Additional considerations addressed in Lessons Learned may pertain to specific situations and could be used as supplemental indicators.

III. Key Policy Issues

To support the implementation of new fees in Texas for electric, hybrid, and alternative vehicles, examples from Washington State and Virginia were evaluated. Washington State serves

[94] Vlasic, 2013.
[95] "Transportation: Alternative Funding," 2013.
[96] "Fact Sheet," 2012.
[97] Galbraith, 2010.
[98] "Average Fuel Efficiency of U.S. Light Duty Vehicles," 2013.
[99] McCue, 2013.

as a relevant case study since it is a member state of the Western Association of State Highway and Transportation Officials (WASHTO) that succeeded in passing an EV fee in a recent legislative session. Virginia passed landmark legislation by eliminating the gas tax altogether in favor of higher sales taxes and included an EV registration fee in the bill. The legislation recently passed by the Virginia House and Senate merits consideration because it passed with an evenly divided Senate, a Republican House of Delegates, and was signed by a Republican governor. The political environment and relative level of the gas tax in each state vary considerably, and for these reasons Virginia may be more comparable to Texas than Washington State.

Texas

On average, Texans pay approximately $85 annually in gas tax. This number was calculated based on an assumed (for comparative purposes) 12,000 miles driven per year and a gas tax of 15¢ per gallon.[100] The 15 cent gas tax excludes the 5¢ per gallon of the Texas state gas tax that is funneled directly to education. Using a Texas Transportation Institute (TTI) study as reference, an average of 21 mpg was assumed for Texas drivers in 2009.[101] The $85 annual gas tax incurred by the average Texas driver is notably lower than in both Virginia and Washington State, the two states used for comparison.

Based on Federal Highway Administration (FHWA) road usage data, Texans drove 17.2 million vehicles over 234 billion miles (vehicle miles traveled) in 2010.[102] Using these numbers, Texans actually drive 13,613 miles per year, slightly higher than the actual number of miles traveled by the average Virginian and over 1000 miles more per year than the average Washingtonian. Looking at these three states, the trend shows a regressive pattern, with Texans driving the most yet paying the least in gas taxes. This trend is noteworthy when considering potential future road usage by EV drivers in Texas; road costs to TxDOT will be greater on average than in other states, with no new revenue to compensate for comparatively lower gas tax collections.

Estimates of the future number of EVs in Texas vary widely (4,000 to 57,000 additional vehicles added in 2020)[103], indicating the difficulty of making and using such predictions. The data used for a comparison between states comes from the Center for Automotive Research (CAR), whose study contains estimated data for all three states. CAR, located in Ann Arbor, MI estimates 26,000 EVs registered in the state of Texas by 2015.[104] The estimate, due to Texas' large population and current trends, represents significantly more vehicles than CAR estimates for Washington State or Virginia, potentially exacerbating the problems of road usage and foregone revenue mentioned above.[105]

Washington State

Washington State stands in stark contrast to Texas. With a state gas tax of 37.5¢ per gallon and a higher average fuel efficiency (as determined by the Washington State Department of Transportation—WSDOT) at 25 miles per gallon, a Washingtonian pays $180 annually in gas tax when driving the assumed 12,000 miles per year. When calculating gas tax with the same 21

[100] Texas Transportation Institute, 2013.
[101] Ibid.
[102] Google Public Data, 2012.
[103] The Texas Transportation Institute, Strategic Solutions Center, 2011.
[104] Center for Automotive Research, 2011.
[105] Ibid.

mile per gallon average used for our Texas and Virginia figures, the annual gas tax contribution is even greater. Drivers in Washington contribute much more in gas tax than in Texas or Virginia, and the $100 EV fee passed in HB 2660 does not fully compensate for the foregone revenue. When considering incentives and disincentives, EVs retain an advantage in gas tax costs over traditional gas-powered vehicles at the $100 fee level.[106]

The legislative intent in Washington State, according to a WSDOT official, was to mitigate the loss of gas tax. Additionally, one sponsoring representative suggested EV fees may prompt users to consider road usage costs. The fee introduces road usage charges but does not fully capture lost gas tax.[107] Based on the same FHWA data used for Texas, we find that Washingtonians drive slightly more than their estimated average, at around 12,220 miles per year. Using this figure, our estimated average gas tax payments are reasonably accurate.

In Washington State, officials hoped the electric vehicle fee would be a revenue generating measure included in a bill with a number of other revenue components. Initially very small, the revenue stream from EV fees is expected to grow as EV usage grows; however, based on one revenue estimate from WSDOT, it still may not provide a substantially meaningful revenue stream even after 10 years ($1.1 million).[108] Vehicles like the Chevy Volt and other partial electric vehicles were excluded from the fee because they contained a gas engine.

According to one of the bill's authors, Representative Judy Clibborn, the bill passed once the conversation surrounding EV fees changed. Using the $100 dollar mark as a starting point, the measure failed initially because opponents argued the fee should be lower so as not to penalize EV drivers. After changing the debate to "What is the responsibility of the driver of a car that pays nothing in gas tax?", the bill gained momentum and the discussion shifted to considering $100 as a minimum for the proposed fee.

While the legislature settled on the $100 fee, their primary informational support came from the Joint Transportation Committee. There was little interaction with the Washington State Department of Transportation and it is not clear to what extent that data regarding foregone gas tax or driver characteristics in Washington State were significantly factored into the fee determination.

Hybrid and alternative fueled vehicles are not required to pay this fee, although the fee may be expanded to all vehicles getting greater than 40 mpg as early as this year.[109] Moreover, all additional fees on fuel-efficient vehicles will sunset with the implementation of VMTs (discussed below).

Virginia

Falling somewhere in between Texas and Washington State is Virginia. On average, Virginians pay $100 in annual gas tax. This is based on a 17.5 cent per gallon gas tax in Virginia as of 2013, which has not been changed since 1986, an average of 12,000 miles driven per year, and an average of 21 mpg per vehicle.[110]

In 2013, Virginia's Governor Bob McDonnell indicated overhauling current transportation financing as a priority for his last year in office.[111] The governor submitted House

[106] Smith, February 1, 2013.
[107] Ibid.
[108] Smith, February 5, 2013.
[109] Clibborn, 2013.
[110] "Virginia Legislature Kills Gas Tax Bills, 2011.
[111] Press Release, 2013.

Bill 2313 outlining his goals, which included an electric vehicle fee of $100. The main portion of the bill focused on the elimination of the gas tax in exchange for an increase in the sales tax. After several iterations of the bill, which saw the temporary removal of the electric vehicle fee and a lesser $50 fee, the $100 EV fee was reinstated and passed by both the House and Senate. The Governor later amended the fee from $100 to a $64 fee.[112] This fee applies to both EVs and hybrid vehicles.

As stated in a press release on Governor McDonnell's website,

> The intent of this fee assessed to drivers of alternative fuel vehicles was to ensure that they pay their share for road maintenance and wear and tear caused by their vehicles. The original proposal for a $100 fee was based on a 17.5 cents-per-gallon gas tax. The conference report establishes a lower rate of taxation on gasoline. As such, this amendment ensures equity in how different types of vehicle fuels are taxed.[113]

Although this appears driven by a use-based approach, the transition to a sales tax also in the bill runs counter to a user fee as drivers no longer pay for road usage.

The bill introduced by Governor McDonnell in Virginia was more contentious than Washington State's bill. The initial bill proposed to eliminate the gas tax (primarily a user fee), increase the sales tax, increase the wholesale tax on gasoline & diesel, assess a $15 charge on drivers for public transportation, and a $100 fee for all electric vehicle and hybrid drivers.[114] The bill was considered controversial for several reasons; however, only one of those criticisms concerns EV registration fees. Lacking a gas tax, which was eliminated in the bill, the fee levied on EVs and hybrid vehicles appears to be a penalty. Therefore, in addition to generally lacking transparency with respect to the matrix above, McDonnell's proposal exhibits weaknesses when evaluated on parity, user fee assessment, gas tax equivalence, and EV incentives. From the perspective of revenue generation, the predicted minimum of $880 million per year for the complete transportation funding package was enough to garner support for the bill.[115] Although the final amended bill reduced the EV fee from $100 to $64, these criticisms were not fully addressed.

Fee Structures for EV/Hybrid/Alternative Fuel Fees

EV Gas Tax Recovery (EV Fee only)

The EV gas tax recovery structure aims to achieve parity between the gas tax paid by a standard gasoline fueled car and the gas tax foregone by purely electric vehicles. The fee level can be calculated based on miles traveled annually, estimated average gas consumption, and the current tax level. In Texas, an appropriate fee for gas tax recovery would be $97.23. This figure was calculated using actual vehicle miles traveled in Texas and the 21 mpg average fuel efficiency previously assumed.[116]

This method provides ease of implementation with a single fee level. It targets electric vehicles only and requires no calculation at the time of payment since the same fee applies to all vehicles at the time of registration. The gas tax recovery fee compensates for lost revenue and

[112] Rubin, 2013.
[113] Press Release, 2013.
[114] Howell, 2013..
[115] HB2313 Conference Report, 2013.
[116] Texas Transportation Institute, 2013.

theoretically introduces "road usage" into drivers' considerations. However, this fee structure only charges electric vehicles, not hybrids or alternatively fueled vehicles, both of which are also not fully charged for their road use. This fee recovers *only* revenue lost when comparing traditional gas-powered vehicles to EVs; it does not contribute to any new revenue generation. Table 1 shows a comparison between Washington State, Virginia, and Texas for how gas tax translates into average gas tax paid given a reasonable assumption of gas mileage and average miles traveled by a passenger vehicle. The estimated gas taxes saved by the calculations shown on Table 1 range from $85-180, depending on the assumption made about average fuel efficiency of passenger vehicles, average vehicle miles traveled and the states actual gas tax rate. However the enacted EV fees in Washington State and Virginia are much lower, $64 and $100 respectively.[117]

Table 1. EV gas tax recovery for Washington State, Virginia, and Texas

	Gas Tax (¢/gallon) [1]	Average MPG [2]	Vehicle Miles Traveled (mi/yr) [3]	Avg. Gas Tax Paid [4]	Enacted EV Fee [5]
WA	37.5	25 (WSDOT assumed)	12,000	$180	$100
VA	17.5	21	12,000	$100	$64
TX	15*	21 (TTI assumed)	12,000	≈$85.71	TBD

*20¢ w/ 5¢ dedicated to education[118]

Tiered Structure (EV/Hybrid/Alternative Vehicle Fee)

A tiered structure for fees broadens the population impacted by new registration fees to drivers of hybrid and alternative fueled vehicles in addition to electric vehicles. Calculations for these fees are similar to those for EV gas tax recovery, but the assumed gas mileage corresponds to a specified class of vehicle. The gas tax paid by these vehicles must be deducted from a standard gasoline vehicle to determine the comparable fee. Table 2 demonstrates an example for the range of fees generated using Texas as a base with arbitrarily selected fuel efficiency ratings for hybrid of vehicles set at 35-45, 45-55, and greater than 55 mpg. Columns 2-5 are copied from Texas data as generated in Table 1. The midpoint of each fuel-efficiency rating (column 6) is used for calculation of estimated gas taxes paid by hybrids (column 7). The tiered sample fee (column 8) represents the difference between the EV sample fee as calculated in Table 1 and average gas tax paid (column 7) by a hybrid vehicle. The estimated gas taxes for hybrid vehicles shown in Table 2 range from approximately $40-$55. This amount is substantially less than the $85-180 calculated in Table 1 for EVs.

[117] For each state the following calculations were made: ([1]/100)/[2]*[3]=[4]
[118] "Transportation: Alternative Funding," 2013.

Table 2. Tiered structure for hybrid vehicles in Texas

Mileage Rating (mpg) [1]	Average MPG [2]	Gas Tax (cents) [3]	Vehicle Miles Traveled (miles/yr) [4]	EV Sample Fee [5]	Estimated Vehicle MPG [6]	Avg. Gas Tax Paid [7]	Tiered Sample Fee [8]
35-45	21	15	12,000	$85.71	40	$45.00	$40.71
45-55	21	15	12,000	$85.71	50	$36.00	$49.71
>55	21	15	12,000	$85.71	60	$30.00	$55.71

This structure has the potential to generate more revenue with a significantly larger vehicle base when compared to targeting EVs exclusively. Hybrids make up a growing share of the market contributing to declining revenues and are subject to fewer gas taxes as the vehicles increase in fuel efficiency. This table demonstrates a simple fee meant to recover foregone gas tax without consideration of road usage. The disadvantage of this plan is that the fee structure becomes more complicated and thus will create a larger administrative burden. Additional complexities exist due to variation in fuel efficiency among vehicles and the need to create vehicle classes based on mileage for assessment purposes while also meeting parity criteria.

Road Usage Recovery (EVs)

Like the gas tax recovery structure, the road usage recovery structure only applies to purely electric vehicles. This fee structure determines a true user fee for EVs; it is not based on foregone gas tax. Every vehicle causes damage to the roads based on vehicle weight and distance traveled, the cost of which is captured only in this plan. Challenging the notion of the gas tax as an accurate user fee today is an advantage of this approach. Since the gas tax has been stagnant for many years, it is no longer sufficient to keep up with the growing rate of population and create funding to reduce congestion and improve road capacities. A road usage recovery fee structure promises to match the fee amount to the car's impact on the roads.

This structure represents a significant departure from the current nature of registration fees on passenger vehicles. The assessment on EVs will be on an entirely different basis than gas fueled vehicles, creating potential for resistance. In the short term, the plan generates inequitable treatment of traditional gas-powered vehicles and EVs. A road usage recovery fee ignores hybrid and alternatively fueled vehicles since those vehicles would be subject to redundant charges. The transition to a road usage recovery structure may not be sufficient to meet revenue demands without the inclusion of heavy vehicle fees based on the same principles.[119]

The Texas Department of Transportation performed its last Highway Cost Allocation Study (HCAS) in 2002. The 2002 HCAS calculated an equity ratio rather than assess a cost per mile for damage caused to roads.[120] An accurate calculation of weight-based road damage would be required to determine an appropriate road usage charge. For this reason, a calculation for a sample fee under this structure is not included in this report.

The state of Washington attempts to calculate a fee for propane and natural-gas powered vehicles similar to the proposed road usage recovery fee. The fee is calculated using the following formula: for vehicles under 10,000 lbs. gross vehicle weight rating (GVWR), the base

[119] Prozzi et al., 2012.
[120] Luskin et al, 2002.

fee is $100. This number is then multiplied by the state motor fuels tax rate (37.5¢ in Washington) and divided by 12¢, yielding a fee of $145.63.[121] Using Texas' state motor fuels tax, a comparable fee in Texas would be set at $125 for a vehicle under 10,000 lbs.

Indexing Fees Based on Either CPI or CCI

Indexing fees can be used in conjunction with any of the above structures with the intent of annually adjusting the rate to maintain original purchasing power without the need for new legislation. An indexed fee retains value in perpetuity. Two methods are available for indexing fees: to the consumer price index (CPI) or the construction cost index (CCI). The CPI is indexed to inflation while the CCI is indexed to costs of transportation related construction materials.

Indexing to the CPI adjusts the fee in relation to purchasing power. However, costs for road improvements could rise at a rate faster than consumer goods used to calculate the CPI. The alternative CCI ties any fee adjustments to the cost of projects funded since transportation material costs (i.e., of steel and concrete for bridges) determine the CCI.

Table 3 provides current estimates for what the gas tax rates would look like assuming indexing since 1991 to the CPI and since 1998 to the CCI. Values used for the CCI are taken from December of each year and assumes a gas tax of 15¢ corresponds to a CCI of 100. The estimates reported on Table 3 suggest that had the gas tax been indexed to either CPI or CCI it would yield $.26 and $.38 per gallon respectively in 2013.

[121] "Washington Laws and Incentives for Natural Gas," 2013.

Table 3. Assumed gas tax in Texas based on indexing since 1991[122] [123]

Year	CPI (%)	Gas Tax Indexed to CPI ($)	CCI (%)	Gas Tax Indexed to CCI ($)
1991	4.2	0.150		
1992	3	0.155		
1993	3	0.159		
1994	2.6	0.163		
1995	2.8	0.168		
1996	3	0.173		
1997	2.3	0.177		
1998	1.6	0.180	119.95	.18
1999	2.2	0.184	112.32	.17
2000	3.4	0.190	122.03	.18
2001	2.8	0.195	133.51	.20
2002	1.6	0.198	127.23	.19
2003	2.3	0.203	137.13	.21
2004	2.7	0.208	139.04	.21
2005	3.4	0.215	164.66	.25
2006	3.2	0.222	204.45	.31
2007	2.8	0.229	194.39	.29
2008	3.8	0.237	203.01	.31
2009	1.6	0.241	167.57	.25
2010	-0.4	0.240	155.51	.23
2011	1.6	0.244	170.47	.26
2012	3.2	0.252	235.80	.35
2013	2.1	0.257	254.67 (March)	.38

IV. Lessons Learned

Synthesis of Fee Structures

The above four fee structures each have advantages and disadvantages. In order to see a visual comparison between the various structures, Table 4 evaluates each proposal on seven principles: parity, gas tax equivalence, revenue generation present, revenue generation future, user fee assessment, customer range, and EV incentives. Parity is a measure of evaluation for whether all drivers are being assessed comparable fees. The EV equivalence and tiered structure meet parity requirements since the charge is based on what other users pay. Gas tax equivalence evaluates how well the fee structure captures lost revenue from foregone gas tax and is similarly

[122] Bureau of Labor Statistics, 2013.
[123] Mason, 2013.

met by the EV equivalence and tiered structure. Present and future revenue generation are measures of how well the fee structure is currently able and will be able to keep up with revenues required for building and maintaining roads. Indexing fees is the best known and simplest method for correlating taxes or fees with time. The user fee assessment evaluates the accuracy of road usage compensation. As mentioned elsewhere, structures based on the gas tax have lost potential and reliability, leaving road usage the primary means of accounting for damage and consumption. Driver Population Covered is a measure of how many drivers are impacted by the new fee structure of the total that could be incorporated. Any structure that only charges EVs is therefore weak on this measure. EV incentive evaluation is a determination of how well the structure encourages the purchase of EVs, hybrids, etc. or counteracts their marketability. For the purposes of this brief, it is assumed that EV charges counteracts incentives. More research needs to be done to determine whether this assumption holds.

Table 4. Comparison between fee structures

Evaluator/Fee Structure	EV Equivalence	Tiered	Road Usage	Indexed
Parity	X	X		
Gas Tax Equivalence	X	X		
Revenue Generation Present				
Revenue Generation Future				X
User Fee Assessment			X	
Driver Population Covered		X		
EV Incentives				X

Additional Considerations & Their Impacts

Region

In the above analysis, a uniform 12,000 miles per year was used as an average for calculating the amount of gas tax paid by a driver in all three states considered. This assumption ignores several regional possibilities that should be addressed in a more comprehensive analysis.

Generally, city drivers accumulate fewer miles than rural drivers; for example, drivers in Houston average around 8,500 miles per year or 2/3 of the Texas average assumed in the above analyses.[124] Incorporating this change into an analysis would affect parity with average gas tax, but should not be the only consideration. City drivers are more likely to drive on congested roads, while rural drivers accumulate more miles. A road usage fee structure or vehicle miles traveled (VMT) tax could be a more accurate method to take these differences into account.

EV and hybrid owners may also be geographically concentrated. This will probably become even truer as charging stations become available in select locations. Purchases are also likely based on income and access to vehicles. According to George Hoffer, as it pertains to Virginia's EV legislation, it may be possible to consider these taxes as a tax on the wealthy, a progressive tax.[125]

[124] Demographia, 2013.
[125] Hoffer, 2013

Drivers also have cause for concern when it comes to what roads they are paying for. As these fees are levied, it should be considered where they are generated, and what projects they should be directed toward if any.

Electricity

As lawmakers seek to incentivize electric vehicles in an effort to lower emissions and reduce fossil fuel consumption, balancing incentives and fees is critical. Incentives must not be seen as outweighed by new fees and 'penalties' for driving an electric vehicle. EV owners still pay for the energy they use through their home electrical bills. As such, they may see additional fees as an added burden on top of the energy costs they are already paying. Some concerns may be alleviated by ensuring effective communication (see below) about paying for road use and the difference between taxes and energy costs.

Communication

As mentioned above, communicating the purpose and intent to EV owners and the general public will be a crucial part of any EV fee. As evidenced by Washington's state legislators, the concept is more palatable when considered as a usage charge rather than simply another fee or penalty intended to generate revenue from a new subgroup. To EV owners and the public, articulating the distinction between paying for energy (gas or electricity) and paying *gas taxes*, which go towards road improvements, is an important step. EV owners are not paying road improvement taxes on electricity drawn from their home to charge a vehicle - as such; they are not contributing to their use of the road. By making these points clear, policymakers could pre-empt potential pushback from the EV and alternatively fueled vehicle community.

Policymakers should consider regional differences, energy costs, and other related factors when considering fee levels to ensure that the level is appropriate for the consumers of the state.

Existing Registration Fees

At present, Texans pay a statewide registration fee of $50.75 on all vehicles under 6000 lbs. and $54 on vehicles between 6,001 and 10,000 lbs. There is an additional $1 automation fee and a $1 fee for the Department of Public Safety. In addition to statewide fees, counties may levy local registration fees of their own. Fees currently range from $0 to $20.[126]

Passenger vehicles in Washington State currently pay $10, $20, or $30 depending on the weight of the vehicle in addition to an annual license fee of $30. Another $3.75 is comprised of minor miscellaneous charges. The State uses a formula comprised of vehicle weight and current gas tax levels to calculate an annual license fee for propane and natural-gas fueled vehicles. The fee is intended to compensate for unpaid gas tax and stood at $145.63 in 2012.[127] Why this fee was not extended to EVs or modified for their application is not clear. Existing registration fees in Virginia range from $40.75 to $51.75 depending on vehicle weight.[128] Some metro counties require additional vehicle emissions fees.[129]

[126] Texas Registration Fees, 2013.
[127] "HB2660," 2012.
[128] DMV Fees, 2013.
[129] Vehicle Registration Information, 2013.

VMT Transition

The EV registration fee in itself is not necessarily the final step in capturing road usage from drivers. As explained by those involved in Washington State, it is a shorter-term bridge measure intended to capture revenue from drivers who otherwise would not be paying their share while simultaneously introducing the concept of paying for road use. Ultimately, the fees will be phased out when the State implements a VMT plan.

Policymakers should consider the lasting effect of any plan to tax EVs, hybrids, and alternative fueled vehicles and what the long term implications and goals imply.

V. Relevance in Texas

Texas, like most other states faces a shortfall in revenue as compared to projected population growth and increased road congestion. This shortfall requires that innovative ideas be explored for more sustainable revenue generation. TxDOT expects revenues to fall short of their needs by nearly $4 billion per year going forward.[130]

Texas already relies on registration fees as a relatively substantial source of revenue (15%).[131] Implementing an additional fee to recover foregone revenue from EV owners should have low administrative costs (compared to many alternatives) and incur no additional burden to drivers beyond cost.

Texas' growth and significant transportation infrastructure needs may require new ways to think about paying for road use. By implementing an EV fee as other states have done, Texas can gradually introduce the concept of road usage charges into the public's understanding of transportation funding.

Additionally, as 21st century technologies bring greater efficiency and reduced fossil fuel consumption, it is important that states move away from substantive revenue streams dependent on gas taxes. Supplementing those sources in the near future with new fees and other mechanisms can provide greater stability going forward. Texas has already embraced other types of user fees, such as tolls, and registration fees tied to road use would be a logical and productive complement to such developments.

Reliance on gas tax has been historically problematic. As mentioned previously, the gas tax in Texas has not been raised since 1991. In some other states this amount of time is even longer. Political climates often make incremental raises to the gas tax impractical. Building a structure such as indexing into fee amounts provides a way around these incremental changes. A solid backing for any proposal based on the above evaluation criteria should, as a baseline, provide a way to justify fee amounts levied against electric, hybrid, alternative, and any newer vehicles.

[130] Batheja, 2103.
[131] House Research Organization, 2009.

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VII. Appendices

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Appendix 2: Websites

Pew Environmental Group: History of Fuel Economy
http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Fact_Sheet/History of Fuel Economy Clean Energy Factsheet.pdf

Washington State HB 2660
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Virginia HB 2313
http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+HB2313ER2

Virginia HB 2313 Conference Report
http://hac.virginia.gov/Committee/files/2013/HB2313/HB 2313 Transportation Conference Report 02-21-13.pdf

Center for Automotive Research: The US Automotive Market and Industry in 2025
http://www.cargroup.org/assets/files/ami.pdf

Appendix 3: Legislative Timeline[132]

Timeline for Virginia's Transportation Bill

Early January 2013: Proposed by Bob McDonnell[133]
$100 fee

January 30, 2013: Passed by House Finance Committee[134]

February 4, 2013: Passed by House
No fee

February 7, 2013: Senate declined to vote[135]

February 22, 2013: Passed by House
$100 fee

February 23, 2013: Passed by Senate[136]
$100 fee

March 25, 2013: Amended by Governor[137]
$64 fee

April 3, 2013: Finalized by Legislature
$64 fee

[132] Virginia's Legislative Information System, 2013.
[133] The Editorial Board, 2013.
[134] Haines, 2013.
[135] Holeywell, 2013.
[136] Kunkle and Vozzella, 2013.
[137] Dawid, 2013.

Weight Distance Charges: State Experiences

I. Executive Summary

This issue brief examines Weight Distance Charge (WDC) systems, an unconventional funding mechanism that both efficiently captures revenue and recoups the costs of highway consumption by heavy trucks.[138] About 70 percent of the ton-miles in Texas are carried by commercial vehicles on 20 percent of the TxDOT system. These corridors are designed to carry heavy volumes of truck traffic, but the recent activity in state gas and oil shale plays has generated unprecedented volumes of trucks on the weakest state and county roadways. TxDOT currently estimates that the cost exceeds $500 million and is rising with new activities in west Texas.[139] A WDC is a revenue mechanism that serves to address the costs of this consumption. Furthermore, increases in fuel efficiency in the transportation fleet and stagnant fuel tax levels exacerbate this funding shortfall for TxDOT.

The objective of this brief is to assess the impact of WDC and outline their relevance to Texas through a state-by-state analysis that examines the above mentioned policy issues in four states that currently use WDCs (Kentucky, New Mexico, New York and Oregon). Several key themes emerge from this research. First, a Highway Cost Allocation Study (HCAS) is essential in order for states to assess cost/benefit parity for users. Second, evasion poses a problem for WDC, but the state can mitigate this through effective penalty structures and enforcement. Finally, the WDC system can be used as a companion funding mechanism by Texas (as in Kentucky) or as the sole funding mechanisms for trucks (as in Oregon).

II. Background

The US Census Bureau estimates that the population of Texas grew at a rate of 3.6% from 2010 to 2013.[140] This growth rate, more than double the national average, suggests that the state will need upgrades to highway infrastructure, as more cars and trucks rely on its large web of highways. Additionally, road consumption due to heavy truck loads from a resurgent oil and gas industry have motivated lawmakers to look for solutions to the problem. Furthermore, states across the country face declining revenue in their state highway funds, as the automobile fleet becomes more fuel efficient and political obstacles preclude the possibility of raising the fuel tax. In 2009, New York received $3 billion from federal and state fuel tax revenues.[141] These collections fell short of providing the state with enough funds for maintenance and new projects to improve its aging infrastructure. The US Federal Highway Administration reports that New York is in the top five highway spending states in the country, along with California, Illinois, Florida, and Texas. All of these states spent over $5 billion in 2011.[142] Texas decision makers, like those of New York and many other states, have recognized that revenues from traditional tax sources are no longer sufficient and seek to find new mechanisms to fund much needed highway projects.

[138] The classification of 'truck' refers to all commercial vehicles that surpass the minimum gross vehicle weight limits for WDC in each state, barring exemptions.
[139] TxDOT 2030, 2011.
[140] Quick Facts, 2013.
[141] Zupan et al., 2012.
[142] Highway Finance Data Collection, 2011.

This shortfall in funding provides the impetus for looking at WDC systems. A WDC system is a road usage charge system, which has historically applied to trucks because they account for most of the highway consumption.[143] The mechanism is a charge - per mile traveled - based on the weight of the vehicle. There are currently four states that have some form of WDC: Kentucky, New Mexico, New York, and Oregon.[144] Two benefits of the system are that WDC can fully capture all costs that trucks impose on roads and, furthermore, it allows states to develop a variable rate structure based on weight and/or distance. Disadvantages to the system also exist. Trucking companies strongly resist WDC both legislatively and legally, thus providing roadblocks for governments when passing, modifying, or implementing the system.[145] Also, it is impractical for states to weigh trucks for each trip and therefore must develop enforcement infrastructure that is both practical and effective.[146]

III. Key Policy Issues

In this section key policy issues related to WDC are analyzed across states. Issues covered are rates, vehicle weight declaration, revenue, other revenue mechanisms, enforcement, evasion, legislative history, and highway cost allocation studies. Please refer to Table 1, found at the end of this section, for a summarized description of each policy variable as it applies to selected states.

Rates

No state has a true WDC rate structure but rather a weight category distance system. Therefore, states charge rates based on categories of weight rather than the absolute weight, for administrative reasons mentioned in Section II.

Kentucky's rate structure (refer to Table 1) is the most basic, charging 2.85¢ per mile for all vehicles above 59,999 lbs. gross vehicle declared weight.[147] Oregon's WDC rate structure is far more complex and varies according to both weight and number of axles.[148] The WDC rates start at 26,000 lbs. and increase every 2,000 lbs. to 80,000 lbs. From 80,000 lbs. to 105,500 lbs. the WDC rates increase at 2,000 lb. increments and also incorporate the total number of axles into the fee structure. Above 105,500 lbs. the WDC does not apply and special permits are necessary. However, trucks weighing over 105,500 lbs. are very rare.[149]

Vehicle Weight Declaration

Weight declaration is important because no state can weigh every individual truck. New York uses two categories to define vehicle weight. As defined by the New York State Department of Taxation and Finance, the gross weight method, which includes the weight of the tractor and trailer as well as weight of the cargo at full capacity, includes all trucks superseding

[143] Harrison, 2013.
[144] In this issue brief, the authors will discuss the domestic use of WDCs. For an international perspective, please see the appendix 3 section A3.1. Additionally, a comprehensive description of WDCs (domestic or international) is beyond the scope of this brief.
[145] Russel, 1994: 2-7.
[146] The Tioga Group, Inc. et al., 2012: 17, 49, A-15-17.
[147] Taylor, e-mail, 2013.
[148] Please see Appendix 2 for Oregon's full rate structure.
[149] ECONorthwest, 2011: 4-2.

18,000 lbs., while the unloaded weight method does not take into account the cargo and applies to trucks greater than 8,000 lbs.[150]

In Oregon and Kentucky, operators must declare a gross vehicle weight, similar to the gross weight method of New York, in order to license their truck. In Oregon, truck operators must declare the highest gross vehicle weight for any trailer configuration.[151] In Kentucky, gross vehicle weight depends on a license obtained by the operator for either a given load or a truck.[152]

Revenue

The revenue generated from WDC depends largely on the additional funding mechanisms each state uses for trucks (refer to Table 1). Oregon generates all of its truck (26,000 lbs.+) revenue from WDC, $270 million in 2012.[153] Kentucky generates $72-$80 million a year from their WDC, about 7% of revenue from their road fund.[154] About 17% of the New Mexico highway fund results from WDC collections.[155] This is the third most significant source of revenue for the New Mexico fund, after the gas tax and the special fuels tax. New York's revenue collection for the WDC averages around $100 million per year.[156]

Other Revenue Mechanisms

Three of the four states discussed in this paper incorporate more than one revenue generating mechanism for their highway fund (refer to Table 1). As stated above, Oregon is the only state that relies entirely on the WDC for revenue generated from trucks greater than 26,000 lbs. While Oregon does charge for permits, the charge covers the administrative costs of issuing the permit.[157] Kentucky has three revenue mechanisms for trucks weighing over 59,999 lbs.: fuel tax, the international fuel tax agreement (IFTA), and WDC.[158] Finally, New York has five revenue mechanisms: registration and title fees, WDC, special fuels tax, fuel tax, and IFTA.[159]

The purpose of the IFTA is to charge operators who purchase fuel outside of the state for their use of the state's infrastructure, otherwise covered by the diesel tax. For example, in New York, IFTA covers all miles traveled within the state and is calculated quarterly based on the average price of fuel. It is possible for the state to audit companies and determine whether they are in compliance with IFTA because trucking companies keep detailed records of fuel purchases.[160]

Enforcement

This section examines how states enforce WDC: the penalty structure and the state enforcement infrastructure.[161] [162] For example, Oregon employs various entities that enforce

[150] New York State Department of Taxation and Finance: 5.
[151] Oregon Department of Transportation Motor Carrier Transportation Division: III-14.
[152] Taylor, phone, 2013.
[153] Dal Ponte, 2012.
[154] Office of Fiscal and Budget Management in the Kentucky Transportation Cabinet: 18-21.
[155] University of New Mexico Bureau of Business and Economic Research, 2001: 16.
[156] State of New York Department of Taxation and Finance, 2012: 29.
[157] Dal Ponte, 2012.
[158] Taylor, e-mail, 2013. While Kentucky does have registration fees, the interviewee did not include this.
[159] Zupan et al., 2012: 29.
[160] New York State Department of Taxation and Finance: 5.
[161] In Appendix A3.2 the authors have included a memo on enforcement and evasion.
[162] For a full list of fines, please visit ATRI site listed in Appendix 2.

WDC, including county weigh masters, state motor carrier enforcement officers, and sheriffs.[163] In Kentucky, the Kentucky State Police Division of Commercial Vehicle Enforcement is the largest group that enforces WDC.[164]

The state of New York can impose a series of penalties on operators who avoid reporting their weight and miles traveled. The state has the right to place a lien on company property and to seize this property in case of failure to report or pay charges for weight distance. Moreover, negligent operators can face from $500 to $2,000 worth of civil fines per failure to report, and $250 to $500 in criminal charges. The violator may also be imprisoned for up to ten days.[165]

Evasion

A high evasion rate is one of the largest arguments levied against WDC.[166] Evasion is defined as the percentage difference between the expected WDC payment and the actual payment.[167] Oregon hired Cambridge Systematics, a consulting firm, to address this issue. The study found Oregon's evasion rate is most likely 5% but may range between 3-7% (refer to Table 1).[168] This evasion rate, according to Gregg Dal Ponte, Oregon Department of Transportation Motor Carriers Division Administrator, is lower than evasion for the fuel tax.[169] Kentucky's evasion rate, according to one Kentucky Transportation Cabinet employee, is about 7-8% but "some have predicted it is as high as 25% or as low as 3-5%."[170] Kentucky has not completed a study on WDC evasion. Meanwhile, in New York, incidence of evasion is high. In a report produced by the American Transportation Research Institute (ATRI), rates of evasion in New York have been reported as high as 49%. ATRI reports that the state should collect between $250 and $300 million a year, yet it only collects between $100 and $150 million. The report finds several weaknesses in New York's implementation of WDC, primarily its enforcement that allows many trucking companies to avoid the charge altogether.[171] Without the state's requirement of modern GPS trackers or electronic stickers, the trucks can avoid detection.

Legislative History

A unique legislative history accompanies each state's WDC, as all states have faced legal and legislative pressure from trucking companies. For Oregon, the WDC system sustained several transformations after it originally passed in 1933.[172] In the early 2000s, the Oregon legislature repealed the WDC as a result of advocacy pressure by the trucking industry. However, this repeal was contested by Oregonians and the WDC was re-enacted.[173] In Kentucky, the WDC was passed in 1982 but was briefly repealed in 1987 and replaced by a Supplemental Highway Use Tax, a flat fee which was ruled unconstitutional the following year. In the third quarter of 1988, the state re-enacted WDC and it has been in place since.[174]

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[163] Dal Ponte, 2012.
[164] Taylor, e-mail, 2013.
[165] New York State Department of Taxation and Finance: 17.
[166] Cambridge Systematics, 1996 Ab-1, Bob Russell, The Tioga Group Inc. et al.
[167] New York State Ton-Mile, 2008: 1.
[168] Cambridge Systematics, 1996: Ab-2.
[169] Dal Ponte, 2012.
[170] Taylor, e-mail, 2013.
[171] New York State Ton-Mile, 2008.
[172] Russel, 1994: 2. ECONorthwest, 2011: 1-3-5.
[173] Dal Ponte, 2012.
[174]Taylor, e-mail, 2013.

There have also been several legal challenges levied against WDC. In Oregon, the trucking association challenged WDC twice: once in the 1950s[175] and again in the 2000s.[176] During both instances the WDC was ruled constitutional. Kentucky faced a similar challenge in the mid-1990s and the court ruled WDC constitutional.[177] While these two states successfully overcame these legal hurdles, other states have failed. For example, in Idaho a WDC was struck down by the State Supreme Court because, as stated in the decision, it unduly affected interstate commerce.[178]

Highway Cost Allocation Study

The HCAS is a tool states use to measure the impacts of vehicle traffic on highways. In Oregon, a constitutional mandate requires a HCAS every two years.[179] In contrast, Kentucky has faced challenges regarding the use of the HCAS. During the first years of Kentucky's WDC, the state partnered with a university to complete several highway cost allocation studies. However, a HCAS has not been conducted for over a decade because of the political controversy that it created. After this controversy, funding for future studies was eliminated.[180]

The importance of implementing a frequent HCAS is recognized by the Federal Government in a report titled *Highway Trust Fund; Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles.* In this report, the US Government Accountability Office recommends;

"To ensure that up-to-date data are available on the road damages imposed by all vehicles types compared with the revenues each contributes to the Highway Trust Fund, we recommend that the Secretary of Transportation direct the FHWA Administrator to revise and publish the agency's Highway Cost Allocation Study and update is periodically as warranted."[181]

[175] Russel, 1994: 2.
[176] ECONorthwest, 2011: 1-5.
[177] Taylor, e-mail, 2013.
[178] Adkins, 2000: 2. This court case made the Idaho Legislature cancel the law. See legislature.idaho.gov/idstat/Title40/T40CH7SECT40-710.htm
[179] ECONorthwest, 2011: 1-1.
[180] Taylor, e-mail, 2013.
[181] United States Government Accountability Office, 2012: 50.

Table 1: Weight distance charges key policy variables

State	Legislation - Interstate issues	Enforcement/ physical infrastructure	Department in charge/ mechanisms for collecting revenue	Weight classes	HCAS	Other revenue collection mechanisms for trucks	Dollar amount collected via weight distance fee	Evasion	Ratio (amount $ consumption caused by trucks/taxes $ collected from trucks)	Gross or Unloaded
KY	Passed in 1982; challenged in 1984 in Kentucky Supreme Court	Enforced primarily by CVIEW, and KY State Police. Administratively enforced by Kentucky Transportation Staff	Division of Motor Carriers in the Kentucky Transportation Cabinet	One weight class: 59,999 lbs. and up charged 2.85¢ per mile	Last HCAS over a decade ago; state stopped because of political issues related to HCAS	Vehicles 26,000 and up: fuel tax and IFTA surtax; trucks 59,999 lbs. and up: fuel tax, IFTA surtax, and weight distance charge	Approximately $72-80 million a year	Lots of estimates (from 3-25%), but on employee's belief is about 7-8%	N/A	Gross Vehicle Weight
NM	Article 15A Weight Distance Tax 1978	Information not available	Taxes collected quarterly and paid to Motor Vehicle Division; all collections go to State Road Fund	Variable charge: 26,001 lbs. to 28,000 lbs. charged 1.1¢ per mile ascending in 2,000 lbs. increments to 78,001 lbs. and up charged 4.34¢ per mile	1972 was the only year the state ever performed an HCAS	Vehicles 26,000 lbs. and up are subject to IFTA surtax	Approximately $90 million per year	N/A	N/A	Gross vehicle weight
NY	New York Tax Law article 37	HUT certificate of motor registration renewed annually or temporary HUT certificate $25 for three days. Decal must be visible on vehicle ($4)	Department of Transportation New York	Similar variable fee structure to NM, beginning at 18,000 lbs. for gross weight	N/A	Vehicles 26,000 lbs. and up are subject to IFTA surtax	Approximately $80 million per year	Some reports suggest up to 45% while others suggest only 5-10% percent	N/A	Gross or Unloaded Weight method - any truck with unloaded weight of 8,000 lbs. or tractor of 4,000 lbs.

State	Legislation - Interstate issues	Enforcement/ physical infrastructure	Department in charge/ mechanisms for collecting revenue	Weight classes	HCAS	Other revenue collection mechanisms for trucks	Dollar amount collected via weight distance fee	Evasion	Ratio (amount $ consumption caused by trucks/taxes $ collected from trucks)	Gross or Unloaded
OR	Passed in 1933; challenged in Oregon Supreme Court in 1950s and 2005	Enforced by weigh stations, gantries, and State Police; administratively enforced by Division of Motor Carriers	Motor Carrier Transportation Division in Oregon Department of Transportation	Variable fee: Weight classes in 2,000 lb. increments from 26,000-80,000. 80,000 and up classes based on weight and number of axles	Constitutionally mandated HCAS every two years to ensure fair cost burden between light and heavy vehicles	Permitting fees: only to recoup administrative cost of issuance. RUAF: for trucks over 98,000 lbs.	In 2012: $270 million	Estimated to be about 5%	Approximately 1	Gross Vehicle Weight

Source: See text for citations

IV. Lessons Learned

Three policy lessons emerge when analyzing WDC: evasion, cost/revenue parity, and the broad applicability of WDC.

Evasion

Evasion presents a serious problem for state governments when implementing a WDC. In New York, some highway experts report that evasion is so high that WDC fails to meet expectations.[182] In an interview with Dr. Richard Mudge, Vice President at Delcan Corporation and author of the above-cited ATRI report, he noted that New York's WDC failed. Mudge went on to discuss the merits of the Oregon WDC system, explaining that the key to success lies in properly enforcing operator compliance. This could involve installing mobile weigh stations along the highways, providing sufficient funding for state troopers, and creating a system which allows troopers to observe compliant vehicles efficiently.[183]

Other research points to the importance of adjusting the penalty structure so that operators are deterred from avoiding payments. A sufficiently large fine for failing to comply with the WDC would compel operators to obey the law. However, the fine should not be prohibitively expensive for operators. A study from the University of Portland provides an economic model comparing the effect of increased enforcement and adjusted penalties.[184] The study concludes that it is more cost effective for states to adjust the penalty structure to lower evasion than to spend incremental resources on enforcement. Regardless, as explained by Mudge, without proper enforcement, WDC will have no chance of success.[185]

Cost/Revenue Parity

In theory, operators under the WDC pay for 100% of their highway use. The HCAS is the best tool for states to determine the impact each vehicle weight class has on the system. The study can provide information that allows the state to determine the actual cost correlating to highway use by individual operators. In order to conceptualize how states determine what is a fair tax for users of the highways system, an equation can be developed which places the costs, as determined by the HCAS in the denominator.

Because most states use various revenue generating mechanisms to fund their highways, a composite number adding these totals belongs in the ratio's numerator. As previously discussed in this brief, these revenues are generally derived from the gasoline tax, other fuel taxes, and registration and licensing fees.

Equation 1

$$Cost\ Revenue\ Parity = \frac{Gasoline\ tax\ +\ Special\ fuel\ taxes\ +\ IFTA\ +\ Registration\ and\ Licensing\ Fees}{Costs\ (Determined\ by\ HCAS)}$$

[182] New York State Ton-Mile, 2008: 6.
[183] Mudge, 2013.
[184] Strathman, 2001: 7.
[185] Mudge, 2013.

As Equation 1 approaches one, states achieve cost-revenue parity. A study published by the Transportation Research Board indicated that heavy truck classes reach parity in only 3 of 22 states that perform highway cost allocation studies.[186] States that do not reach parity are forced to find other revenue to pay for road consumption by heavy trucks. One state that accomplishes parity in the heavy truck class is Oregon. Heavy truck operators pay 100% of the costs incurred by heavy trucks in Oregon. Moreover, in Oregon operators pay for all of their use through one fee: the WDC. The charge has proven to be effective.

Equation 2

$$Cost\ Revenue\ Parity = \frac{Weight\ Distance\ Charge}{Cost}$$

Equation 2 represents cost parity in Oregon, as WDC and cost are equal (refer to Table 1). Reaching cost/benefit parity in Oregon was the result of a well-calculated effort by policy makers, as they first had to determine the actual costs incurred by trucks. Their success lies in their careful implementation of enforcement polity and a tiered penalty system that would strongly discourage evasion. More research is necessary to show whether New Mexico, Kentucky, and New York achieve greater parity than states without a WDC system. Because these states use a weight distance charge in tandem with other mechanisms, determining an exact number for the numerator of the parity equation proves difficult. Moreover, without performing frequent highway cost allocation studies, defining the denominator also proves challenging.

Oregon provides a good example for how the implementation of a WDC might accomplish parity for highway use by trucks. With only one type of charge (WDC) levied on operators, there are fewer administrative costs for the government and more transparent tax system for truck operators.

Broad Applicability of WDC

The final lesson learned from comparing WDC systems is that WDC is a broad revenue mechanism that can be tailored to meet a specific state's needs. How the WDC applies to a state depends on state legislation, precluding the few commonalities in all WDC systems. One can see that Kentucky's WDC uses the most basic fine structure and serves as an ancillary revenue mechanism for trucks. On the other hand, Oregon's complex fine structure is the primary funding mechanism for trucks. New York and New Mexico demonstrate a middle ground between the two extremes of Kentucky and Oregon. Additionally, section III shows at least some asymmetry between states in all WDC aspects. The intentions of the Department of Transportation or Transportation Cabinet also influence the implementation of the WDC, concurrent with legislative directives. Kentucky hired a group of researchers to determine the weight and cost at which a WDC could work. The researchers gave their recommendations, which were adopted at the inception of the WDC, and that WDC system still remains.[187]

[186] National Cooperative Research Program, 2008: 9.
[187] Taylor, e-mail, 2013. Taylor, phone, 2013.

V. Relevance to Texas

As mentioned in the introduction, TxDOT currently faces a shortfall in funding conventional sources for transportation.[188] The 2013 Texas Legislative Session is currently discussing methods to fund TxDOT. A WDC is one revenue mechanism that both helps eliminate revenue shortfalls and targets a generally underpaying category of drivers.

Unprecedented consumption of Texas roadways is another reason for increased funding. The aforementioned boom in natural gas production has intensified this on the roadways.[189] As Texas struggles to finance maintenance and repair for these roads, WDC could provide a potential solution. The characteristics of oil and gas extraction zones provide important building blocks for a WDC system. Firstly, decision makers can identify damaged areas by looking at where oil and gas wells are located. Then, because most heavy vehicle traffic passing through the area is industry related, specific operators are identified and WDC can be levied accordingly.

A natural resource industry parallel exists between Oregon and Texas. Oregon is home to natural resource extraction as well. For example, the logging industry uses heavy trucks to transport lumber, creating stress on Oregon highways. This provides a reason for the state to carefully ensure cost/revenue parity between consumption caused by trucks and revenue generated from truck operators. Because of the biennial HCAS required by the constitution, Oregon ensures that costs and revenue are equal and also that decision makers are aware of costs borne on the road by each truck class.

[188] Batheja, 2013.
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VII. Appendices

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Appendix 2: Websites

American Transportation Research Institute
http://atri-online.org/

Full list of overweight fines
http://www.atri-online.org/state/data/osow_penalties.htm

New York Department of Transportation
https://www.dot.ny.gov/index

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Appendix 3: International Road Pricing Applications for Heavy Vehicles: Lessons Learned for a Future Application in Texas

Sergio Martinez, MS

I. Executive Summary

Why Should TxDOT Be Interested?

Traditional funding for roads are no longer enough to cover infrastructure needs and with significant increases in population forecast and economic growth for the coming years, the Texas Department of Transportation (TxDOT) is facing a growing funding gap. With no political support to increase the fuel tax, TxDOT is in need of finding alternative funding mechanisms.

One area of concern is the trucking sector. Because the wear and tear of roads is directly related to vehicle weight, TxDOT believes that the current fee structure does not appropriately represent the damage caused by trucks. Ideally, road users would pay based on the amount of road consumption, as measured by the number of miles they drive, the vehicle's weight, or both.

Road Pricing

Road pricing has been advocated as an ideal arrangement to relate fees to road usage. Truck-specific applications differ according to the desired objective and the implementation method. According to the model's main objective it could be used to finance infrastructure, or for demand-management purposes. Based on the implementation mode, they can be classified as the following:

- **Single-road pricing:** Only certain roads are subject to the charges.
- **Cordon pricing:** A cordon is designated around a specific area with limited entry points and a fee is charged to the vehicles that cross the cordon into the designated area.
- **Network pricing:** The system operates in the entire road network.
- **Area pricing:** Drivers pay to enter a designated area but can drive freely within the area.

Since TxDOT's interest in truck pricing stems from a need to raise additional revenues to cover road maintenance needs, and because the desired applicability would be for the entire state road network, this reports focuses on the systems implemented by New Zealand, the Euro-Vignette, Switzerland, and Germany because of their similar objectives and large-scale implementation approach. The prospective system in Russia is briefly examined as a potentially good example for the future.

II. Background

Road pricing has been a case of many proposals with few successes, but the potential for success has been increasing, as technology is no longer a major barrier, and governments worldwide are facing budget shortfalls that require alternative solutions.

The main reason for pricing schemes' failure seems to have been lack of public acceptance. Other reasons are related to issues of equity, economic impact, technology, and scheme design. Following are some highlights from the Lessons Learned section (Section IV).

- New Zealand
  - Maintaining the simplicity of the system (even at the cost of exempting some users) is more beneficial than trying to make it very detailed—trying to capture every possible user type adds complexity, and increases management and enforcement costs.
- Euro-Vignette
  - A time-based pricing scheme does not offer as direct a link between road charges and actual road consumption as a distance-based scheme would. However, implementing it would still be an improvement to traditional road funding with operation costs significantly lower than those of a distance-based system.
- Germany
  - A clear rationale and objectives agreed upon by all stakeholders are key to the success of a pricing model.
  - Political interests should not be allowed to interfere with agreed-upon principles and objectives as this erodes stakeholders' support for future projects.
  - The magnitude and complexity of the scheme need to be the drivers for the determination of a realistic implementation schedule.
  - Privacy concerns related to data protection and security need to be fully addressed as part of system design and implementation.
- Switzerland
  - The Swiss Heavy Vehicle Fee (HVF) is a perfect application of the "user pays" and the "polluters pay" principles, as it internalizes all the road freight costs, including externalities.
  - Because the HVF was implemented in combination with an increase in the maximum allowed weight, the scheme not only reduced truck traffic and increased revenues, but also increased efficiency.
- The German Heavy Goods Vehicle (HGV) tolling system has a multi-factor toll rate basis and is the largest, most complex, and most technologically advanced. Therefore, it is a good example to follow. Besides, with TxDOT's goal for such a system the same as Germany's of raising additional revenues, the author considers that Germany's model should be the main example to consider when TxDOT is ready to proceed.

Additional recommendations and thoughts expanded upon in the Lessons Learned section (Section IV) include the following:

- The American Trucking Association has expressed that they would be open to consider pricing if it is a voluntary scheme and alternate routes are available for those who can't pay. Their main concerns include the perception of pricing as a type of double tax, and the possibility of having the revenues from the pricing scheme funneled into general funds or other not-transportation funds.

- Researchers from the Center for Transportation Research (CTR) at the University of Texas at Austin investigated whether the provision of incentives to non-toll truck road users would divert them into a toll road. They found that the preferred incentive was the provision of a fuel tax refund for the miles traveled on toll roads.
- Performance measurement is crucial to managing and increasing goal attainment. For this reason, TxDOT should give special importance to keeping track and informing stakeholders and the public about the benefits of the pricing scheme.
- For a pricing scheme to succeed, TxDOT would need to build coalitions around common-good principles and objectives such as "users pay but also benefit from the payment," or "polluters pay" to gain political and community support.
- With such a volatile political climate nowadays in Texas, TxDOT needs to clarify from the beginning that whatever is agreed upon needs to be respected for the duration of the system.

Table 1 presents a summary of the main characteristics of the truck pricing schemes included in this report.

Table 1. Summary of the main characteristics of the road pricing schemes in this report

Country	Purpose	Applicability	Rate Basis	Technology
New Zealand	Finance and maintenance of roads	Diesel powered vehicles and all vehicles over 3.5 tons. Entire road network	Vehicle weight and distance traveled	Combination of distance recorder and hubodometer, or electronic distance recorder
Euro-Vignette	Highway construction, maintenance and operations	Trucks over 12 tons on motorways and selected A roads. Time-based	Number of axles and duration of the permit	Electronically or physically bought permit. No tracking of vehicle
Switzerland	Internalizing all the road freight costs, including externalities	Heavy-goods vehicles with permissible laden weight over 3.5 tons, irrespective of national registry. Entire road network	Distance traveled and vehicle's permissible laden weight and emissions classification	On Board Unit linked to tachograph and Microwave Radio Connection
Germany	Mainly to raise revenues. Also to incentivize shift from trucks to rail and water; stimulate use of cleaner trucks; encourage more efficient routing and scheduling	All vehicles with a total permissible weight over 12 tons, irrespective of national registry. Entire road network	Distance traveled, and vehicle's emission classification and number of axles	Global Positioning System, Global System for Mobile communication, On-Board Units, Dedicated Short-Range Communication, and Automated Number Plate Readers.
Russia	Could not be determined	Trucks over 12 tons on federal roads	Distance traveled	GLONASS (Russian GPS) and GPS

Source: Author

Purpose of Truck Pricing

Transportation in the US is facing serious challenges as traditional funding mechanisms, such as federal and state fuel taxes, permit fees, and others, are no longer enough to cover infrastructure needs.[190] Texas is certainly not the exception, and with significant increases in population forecast and economic growth for the coming years, TxDOT is facing a growing funding gap. With no political support to increase the fuel tax, TxDOT is therefore in need of finding alternative funding mechanisms that allow it to continue to perform its functions. One area of concern for TxDOT is the trucking sector and their contribution to the system's funds in relation to their "road consumption." Because the wear and tear of the roads is directly related not only to the number of vehicles driving on them but especially to their weight,[191] TxDOT believes that the current fee and permitting structures do not appropriately reflect the relationship between the damage caused and the amount that trucks contribute to the system. In other words, they consume more than what they currently paying for.

Ideally, every road infrastructure user would pay their fair share for the use of the roads and bridges thus contributing to the sustainability of the system. In practical terms, this means that road users would pay based on the actual amount of road consumption, as measured by the number of miles they drive, by the vehicle's weight, or both. This is far from being a new concept. Road pricing as it is most commonly known, has been advocated by many, in particular economists, as an ideal arrangement to relate fees to road usage, with potential benefits that include increased revenues, reducing traffic congestion and decreasing vehicles emissions.

Truck-specific applications differ according to the desired objective and the implementation method. New Zealand, France, and Germany employ truck pricing to finance infrastructure, while the United Kingdom and Switzerland do so for demand management[192] purposes. Based on the implementation mode, they can be classified as the following:

- **Single-road pricing:** Only certain roads are subject to the charges, e.g., Norway, France.
- **Cordon pricing:** A cordon is designated around a specific area with limited entry points. A fee is charged to the vehicles that cross the cordon into the designated area, e.g., Norway, Italy.
- **Network pricing:** The system operates in the entire road network, e.g., Germany, New Zealand.
- **Area pricing:** Drivers pay to enter a designated area but can drive freely within the area, e.g., United Kingdom, Switzerland.

[190] Jolanda Prozzi et al., "Oversize/Overweight Vehicle Permit Fee Study," University of Texas at Austin Center for Transportation Research, Austin, TX, 2012, 1

[191] The Equivalent Single Axle Load (ESAL) methodology to compare pavement life consumption between vehicles of different weights and/or axle configurations showed that the pavement consumption increases non linearly to the fourth power for increased axle weights. American Association of State Highway and Transportation Officials. *AASHTO Guide for Design of Pavement Structures, 4th Edition* 1993

[192] Demand management refers to the goal of reducing the demand for transportation. It is usually associated with objectives such as reducing traffic congestion and vehicles emissions by reducing the number of vehicles circulating and/or the number of trips made.

Each of these models has inherent advantages and disadvantages; however, the specific model seems to be selected based on local conditions and political reality rather than economic theory.[193]

Because TxDOT's goal would be to implement the pricing scheme along its entire road network, with the objective of raising additional funds to compensate for truck road consumption, this report focuses on network pricing schemes for heavy vehicles developed for the sole purpose of financing infrastructure. A scan of international truck pricing schemes was performed to inform TxDOT leadership about experiences and lessons learned elsewhere, and about the potential applicability of such a scheme in Texas.

III. Key Policy Issues

Efforts to proportionally charge trucks for their road consumption are not new, although recently the number of countries considering these types of schemes has been increasing. Reasons for the increased interest include increasing funding needs, concerns with growing congestion and environmental pollution, and the widespread development of technologies that facilitate pricing implementation.

Because of their disproportionate impact on roads as well as the reduced number of vehicles in comparison to the total vehicle population (which facilitates the implementation), large-scale pricing schemes have focused on heavy vehicles, with some countries considering a future expansion to all of their vehicles. Since TxDOT's interest in truck pricing stems from a need to raise additional revenues to cover much-needed road maintenance needs, and because their desired applicability would be for the entire state road network, this reports focuses on the systems implemented by New Zealand, the Euro-Vignette, Switzerland, and Germany because of their similar objectives and large-scale implementation approach. The prospective system in Russia is briefly examined as a potentially good example for the future.

New Zealand

The pioneers of truck pricing, New Zealand started a Road User Charge (RUC) program in 1978 with the purpose of taxing vehicles according to the costs they impose on the road system, basing it on the user-pays principle for the financing and maintenance of roads.[194] The system links distances driven to road use costs for diesel powered vehicles and for all vehicles over 3.5 tons.

The rationale for including diesel-powered vehicles is that vehicles powered by other fuels (petrol, liquefied petroleum gas, or compressed natural gas) are subject to a fuel excise duty that is included in the fuel price and covers most of the share of their costs. But, since diesel is used significantly (about 36% of total diesel sales) by non-transport users such as farms, manufacturing, and industrial users, taxing diesel would increase their compliance costs while still not providing for the extra road consumption costs of heavy vehicles.[195] The collected revenues are transferred into the National Land Transport Fund (NLTF) and are used mainly for road construction and maintenance. In February 2012, the Road User Charges Act 2012 was

[193] Transportation Research Board, International Perspectives on Road Pricing. Conference Proceedings 34, (Washington, DC, 2005), 53

[194] Road User Charges Review Group, An Independent Review of the New Zealand Road User Charging System, 2009, 20

[195] "Road User Charges Act 2012 questions and answers," New Zealand Ministry of Transport, http://www.transport.govt.nz/ourwork/Land/Pages/RoadUserChargeslegislationchangesQandAs.aspx

passed to replace the Road User Charges Act of 1977 and was expected to be implemented by August 2012. Some of the most important changes included in this Act, which should to be considered by TxDOT, include the designation of a permanent weight license and the elimination of time licenses, as explained next.

Licenses

All RUC vehicles will be assigned a permanent RUC weight: for smaller trucks usually the manufacturer's maximum gross weight; for larger trucks likely the maximum weight allowable for its type under the Vehicle Dimensions and Mass Rule of 2002. Under the previous Act, vehicle operators had to estimate the actual gross weight to be carried by their vehicles during each journey. This was usually difficult, not only because it meant that they had to predict the weight to be carried in advance, but also because scales are not always available at loading sites. But a regulatory reason also motivated this change: to try to reduce weight-based evasion from operators that deliberately underestimated the carried weight.[196]

Time licenses were used by a very small number of vehicles (about 1% of the total number) including construction heavy machinery, road maintenance, and unregistered vehicles operated under trade licenses, to travel on roads for specific periods of time. These licenses were created because most of those vehicles do not travel on roads very frequently, but also because most of them cannot be easily fit with distance recorders. Time licenses were eliminated under the 2012 Act because the costs to administer them, the complexity they added to the system and the difficulty in setting fair charges were deemed higher than the benefits they provided. In consequence, previous time licensees will be exempt from RUC charges but will continue to pay annual license fees, some of which will be increased.[197]

Data Collection and Rates

Vehicles operating under distance licenses are required to have a distance recorder as the rates are calculated based on the vehicle weight and the distance traveled (licenses are sold in multiples of 1,000 kilometers). If the vehicle is over 3.5 tons, it also needs to have an approved hubodometer, or electronic distance recorder.[198] Electric vehicles are exempt. Users that want to carry loads higher than permitted by their weight license, are required to purchase an "additional license."[199]

The charges are collected by agents of the New Zealand Transport Agency as well as online.[200] Determining the rates to pay depends on the specific type license and vehicle type. This results in a high number of variations and rates tables which are difficult to summarize here. However, the complete list of rates can be found on the New Zealand's Transport Agency website under "Road User Charges" in the "Registration and Licensing" section.

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[196] Ibid.
[197] Ibid.
[198] "RUC Distance Recorders," New Zealand Ministry of Transport, http://www.nzta.govt.nz/vehicle/registration-licensing/ruc/distance.html
[199] "About RUC," New Zealand Ministry of Transport, http://www.nzta.govt.nz/vehicle/registration-licensing/ruc/overview.html
[200] "Road User Charges," New Zealand Ministry of Transport, http://www.transport.govt.nz/ourwork/Land/pages/roadusercharges.aspx

Eurovignette

The European Commission, in 1999, adopted directive 1999/62/EC[201] "*on the charging of heavy goods vehicles for the use of certain infrastructures,*" setting common rules for the tolling of trucks for member states, and encouraging member states to introduce a common system of user charges. As a result, Belgium, Denmark, Luxembourg, Germany, the Netherlands, and Sweden agreed to the development of a common sticker-based road-user charge system, the *Eurovignette,*[202] to charge all trucks over 12 tons for the use of motorways and selected A roads during specific periods of time. The system's revenues are used for highway construction, maintenance and operations.[203]

While in 2003, Germany left the Eurovignette to start its own distance-based heavy vehicle tax,[204] national vignettes were created in Bulgaria, Hungary, Poland, Rumania, Slovakia and Turkey in the last years. The problem with Vignettes is that, since they are sold for specific periods of time irrespective of the distances traveled during that time, they do not reflect road usage which undermines the "user pays" principle and, does not provide incentives for increasing trucks productivity. Besides, non-electronic Vignettes are especially subject to evasion as random checks are the only way to verify their compliance.[205]

In 2008, the Eurovignette became an electronic system changing its name to e-Vignette,[206] and allowing online bookings 24 hours a day all year long in addition to 800 physical points of sale. The switch to become an electronic system increased its cost-effectiveness by reducing the system's operation costs from 8 to 5% of the total annual revenues.[207] Table 2 shows the current Euro-Vignette rates for 2013, according to the vehicle's number of axles and the period of time for which the vignette is required.

Table 2. Eurovignette tariffs for 2013 in US$

Number of axles	**max 3**	**min 4**	**max 3**	**min 4**	**max 3**	**min 4**
Day	10.5	10.5	10.5	10.5	10.5	10.5
Week	34.1	53.7	30.1	48.5	26.2	43.2
Month	125.8	203.1	111.4	183.4	98.3	163.8
Year	1,257.6	2,030.5	1,113.5	1,834.0	982.5	1,637.5

Source: http://www.ages.de

[201] On September 27, 2011, this directive was amended by Directive 2011/76/EU. Among other things, the new directive specifies the right that each member state has of charging tolls or user charges on any road that is not part of the trans-European road network, provided the imposed charges do not "discriminate against international traffic and do not result in the distortion of competition between operators." *Directive 2011/76/EU Of The European Parliament and Of The Council of 27 September 2011 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.* Office Journal of the European Union.

[202] In this context, a vignette refers to a colored toll-sticker that is to be affixed on a vehicle to show that the corresponding road tax has been paid.

[203] Hubert Humphrey Institute for Public Affairs, "Heavy Vehicle Tolling in Germany: Performance, Outcomes and Lessons Learned for Future Pricing Efforts in Minnesota and the U.S.," University of Minnesota, 2008, 12

[204] Office of Transportation Policy Studies, Federal Highway Administration, *Issues and Options for Increasing the Use of Tolling and Pricing to Finance*, 2006, 3-14

[205] Cesar Queiroz et al., Road User Charges: Current Practice and Perspectives in Central and Eastern Europe, The World Bank Group, 2008, 4

[206] Humphrey, Tolling in Germany, 12

[207] "E-Vignette – The efficient toll system," AGES, http://www.ages.de/en/e-vignette-efficient-road-pricing.html

Germany

The German Heavy Goods Vehicle (HGV) tolling system is the world's first satellite-based, country-wide electronic tolling system. It is managed by "Toll Collect" (http://www.toll-collect.de/en/), and it applies to all vehicles with a total permissible weight over 12 tons, irrespective of national registry. The system has different toll rates per distance traveled, according to four categories based on the vehicle's emission classification and on the truck's number of axles.[208]

The system, which started operations in 2005 (a year later than planned) in the 12,000-kilometer Autobahn system, and on 2007 (with expansion on 2012) in some of the country's 'A' roads, was implemented mainly to raise revenues through a "national mileage-based, 'user-pays' infrastructure fee for trucks."[209] Additional objectives included the creation of incentives to shift freight traffic from trucks to rail and water; to stimulate the use of clean-technology trucks; and to encourage more efficient routing and scheduling of trucks.[210]

To track the vehicles while ensuring free-flow traffic, the system relies on Global Positioning Systems (GPS), Global System for Mobile communication (GSM), on-board units (OBU), Dedicated Short-Range Communication (DSRC), and automated number plate readers (ANPR).[211]

Using the System

The system allows for three different ways to log in: automatically via a vehicle On-Board Unit (OBU), manually at a toll station terminal, and manually online.[212]

- **Automatic:** This option is allowed by the OBU which uses GPS signals combined with dead reckoning and speedometer signals to determine the truck's position and the distance traveled. With this information, plus the vehicle-specific information (emission category and number of axles) already stored, the OBU calculates the amount of toll owed. It then sends this information through GSM to the Toll Collect computer centre. The OBU is provided free of charge and it remains under Toll Collect's property. The costs to the user include the OBU installation (and deinstallation) and changes to the vehicle's information stored in it, such as a change in the emission category.
- **Manual:** This type of log-in is suited to trucks that do not use German roads very frequently. It can be done in two different ways:
    - **At a terminal:** Toll terminal stations are located near the ramps to the motorways. To use this option, a user needs to enter the vehicle's data, the starting and ending location of the trip, and the starting time. With that information the terminal will calculate the shortest route, which the user may or may not accept, and then proceeds to pay the corresponding fare. No pre-registration is necessary for logging-in this way.

[208] American Association of State Highway and Transportation Officials, Federal Highway Administration & Transportation Research Board, *International Scan: Reducing Congestion and Funding Transportation Using Road Pricing*. 2010,
[209] "HGV toll in Germany," AGES, http://www.ages.de/en/hgv-toll-germany.html
[210] American Association, *International Scan*, 7
[211] Ibid.
[212] "Log-On," Toll Collect, http://www.toll-collect.de/en/all-about-the-toll/log-on.html

- **Online:** To log in online, the procedure is similar to the one at a terminal station, except that the route can be reserved up to three days before the beginning of the journey and the user needs to register with Toll Collect.

Enforcement

The Federal Office for Goods Transport (BAG) is the entity in charge of enforcing the toll system while Toll Collect, the toll operator, provides the required technology. Because an important tenet of the system was to not interrupt traffic, automatic enforcement via fixed control bridges is a key element of the system. It is important to note that both the number and the location of such control points is solely determined by BAG, with no influence whatsoever by Toll Collect. The system is enforced in two ways: [213]

- **Automated:** Fixed control bridges track trucks via infrared sensors while a detection unit scans them three-dimensionally to determine their contour, weight, and number of axles. Based on this assessment the system determines if a toll payment was required. Simultaneously, DSRC technology is used to determine if the vehicle has an OBU and this one is activated. Otherwise, the license plate number is photographed and matched against the database records. If it is determined that the vehicle was not required to pay a toll, or if it was but the toll has been paid correctly, the vehicle's information is deleted. Else, the vehicle's information is sent to BAG officers for an on-the-spot inspection.
- **Mobile:** Approximately 300 mobile teams supplement the automatic enforcement bridges nationwide. In addition to providing support near the automated control bridges, in areas where no automated enforcement exists they rely on infrared technology to determine if a passing truck has been logged onto the system, and to see if the vehicle's payment information is correct. If they find an irregularity they can stop the truck.

Data Security

Protocols for data protection and security were developed at the contract's tender stage and are continuously coordinated with BAG and the Federal Commissioner for Data Protection. They include permission to process data for the toll system, strict prohibitions for the use of the collected information, and short deletion deadlines. For example, drivers cannot be recognized in the photos and only the registered user receives the information about the route, time, and toll charged to the truck. Additionally, the OBU does not record information on the truck's speed or load.

Toll rates range from 29 to 60 US¢ per mile as seen in Table 3, which presents the current toll rates based on the vehicle's emissions category and number of axles. As of 2012, the toll system had raised between 4 and 5 billion Euros per year, with operation costs of approximately 15 to 20%.[214]

[213]"Enforcement," Toll Collect, http://www.toll-collect.de/en/help-services/faq/enforcement.html

[214] Norbert Schindler, "The Ascent of Satellite-Based Tolling Systems in Europe and Beyond," Presentation at the IBTTA Symposium on Mileage-Based User Fees & Transportation Finance Summit, Jersey City, May 1, 2012, 15

Table 3. Toll collection rates (original units were euros per kilometer)

Toll Category	Emissions Category	Number of Axles	US$ per Mile
Category A	S5, EEV class 1, S6	up to 3	0.29
		4 or more	0.32
Category B	S4, S3 with PMK 2, 3, or 4	up to 3	0.35
		4 or more	0.39
Category C	S3 without PMK, S2 with PMK 1, 2, 3, or 4	up to 3	0.4
		4 or more	0.43
Category D	S2 without PMK, S1 and vehicles not assigned to an emissions class	up to 3	0.58
		4 or more	0.6

Source: http://www.toll-collect.de

Switzerland

Switzerland is located in the middle of Europe and therefore a key conduit for transalpine traffic. Because cargo traffic in this region is predominantly carried by truck and had been increasing rapidly in the last decades, the population rebelled against the increased truck traffic until a constitutional article was created for the protection of the Alps in 1994. The article reduced the number of trucks allowed to pass through to 650,000, causing tense relations with the European Union (EU) of which Switzerland is not a member. After years of negotiations, both parties agreed to the implementation of a Heavy Vehicle Fee (HVF) for domestic and foreign trucks across the entire country, and the recognition by the EU of the Swiss government's goal of shifting traffic from truck to rail. In return, Switzerland agreed to increase its weight limit for trucks, from the then-allowed 28 tons to the EU-approved limit of 40 tons. [215]

The HVF is levied upon heavy-goods vehicles with a permissible laden weight over 3.5 tons and it is based on the distance traveled on Swiss territory, and on the vehicle's permissible laden weight and emissions. The system was implemented the first day of 2001,[216] with the main goal of internalizing all the road freight costs, including externalities such as health and environmental costs, to avoid the otherwise inevitable indirect subsidization from the government and the public to the roads users. The first of its kind in Europe (and perhaps in the world) the HVF is a perfect example of the "users pays" and the "polluters pay" principles.[217]

Rates and Revenue

To estimate the fee, the distance traveled is multiplied by the vehicle's *maximum* permitted weight and by the corresponding rate according to the vehicle's emission category. The maximum weight is used for both simplicity and also to incentivize efficiency and a reduction in the number of empty trips. Current rates are as follows:[218]

[215] Swiss Confederation, Federal Office for Spatial Development, Fair and Efficient. The Distance-related Heavy Vehicle Fee (HVF) in Switzerland, 2012, 4-6
[216] "Distance-related heavy vehicle fee (HVF)," Swiss Confederation, Federal Office for Spatial Development, http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=en
[217] Swiss Confederation, *Fair and Efficient*,8
[218] Swiss Confederation, *Fair and Efficient*, 14

- **Fee category 1 (Euro 0, I and II):** 3,07 centimes per ton-kilometer (US$0.048 per mile)
- **Fee category 2 (Euro III):** 2,66 centimes per ton-kilometer (US$0.048 per mile)
- **Fee category 3 (Euro IV–VI):** 2,26 centimes per ton-kilometer (US$0.032 per mile).

The scheme's revenues are split, with one-third going to the cantons (states) to help cover their transportation costs, and the remaining two-thirds going to the federal government to finance major rail projects[219] to help with the shift towards rail. The scheme has been successful in reducing truck traffic and increasing efficiency, mainly because the HVF was implemented in combination with increase in the maximum permitted weight. Additionally, since fees are dependent not only on weight but also on the vehicle's emission category, a significant move towards cleaner vehicles was observed prior to the system's implementation resulting in a decrease in total emissions from heavy vehicles.[220]

Data Collection

Domestic vehicles are fitted with a free electronic On-Board Unit (OBU) linked to the tachograph to record the distance traveled, the maximum weight and emissions category are also stored in the OBU. If the vehicle crosses the country's border, a microwave radio connection deactivates/activates the OBU accordingly. Every month the operators need to register their vehicle's information by either mailing a chip card or entering the information online. Because OBUs cannot be mandated for foreign trucks, they have the option of either using an OBU (also free) or to manually register their information at entry and exit of the country.[221]

Russia

Russia is about to implement what it would be the largest toll system in the world, starting in 2014. Because a truck pricing scheme is still far from becoming a reality in Texas, TxDOT should keep an eye on it as its systems would have been in operation for some years by the time Texas starts to seriously consider developing its own.

Initially, the satellite-based system would charge an estimated 2 million OBU-equipped trucks over 12 tons for the distances they traveled on approximately 31,000 miles of federal roads. The tracking of the vehicles would rely on GLONASS (the Russian equivalent to GPS) and GPS signals and it is expected to be expanded to another 31,000 miles of regional roads in subsequent stages.[222]

Despite the size of the project, the system will be managed by a single operator, and toll rates will be determined by the government with preliminary estimates of US$0.18 per mile. The Russian Ministry of Transport estimates the revenues from the heavy truck federal road passage fee at about US$12.77 billion per year.[223] According to Vladimir Kryuchkov, chief executive

[219] "Distance-related heavy vehicle fee (HVF)," Swiss Confederation, Federal Office for Spatial Development, http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=en
[220] Swiss Confederation, *Fair and Efficient*, 18
[221] Swiss Confederation, *Fair and Efficient*, 12
[222] Schindler, Satellite-Based Tolling, 19
[223] "Russia estimates earnings of US$12.77 billion from truck tolls," ITS International, http://www.itsinternational.com/sections/general/news/russia-estimates-earnings-of-us1277-billion-from-truck-tolls/

officer of ITS Russia, there are plans to expand in the future into a national system that would charge all vehicles for the use of certain roads.[224]

IV. Lessons Learned

The literature shows that in general, road pricing has seen many proposals with few successes, but also that the potential for success has been increasing steadily in the last decades.[225] Technology is no longer a major barrier (at least not from a technical perspective although perhaps from a financial one), and also that governments and transportation agencies worldwide are facing widespread budget shortfalls that require alternative solutions.

The main reason for the failure of pricing schemes in the past seems to have been lack of public acceptance. Other reasons that have been reported frequently include equity, economic impact, technology, and scheme design.[226] It is important to reiterate that the political climate and local conditions have frequently eclipsed economic principles as the basis for some models, [227] and therefore should be included in the list of elements to consider.

This report presents a review of some international road user charge schemes for heavy vehicles, and intends to present a summary of good practices and lessons learned, in particular with respect to technology and scheme design. Specific highlights from the included pricing models are presented below.

- New Zealand
    - The fact that distance licenses are based on multiples of a certain distance (in this case 1,000 km) should make for a simple system, although it could be an inefficient option for infrequent users. Besides, since the rates are based on a variety of combinations of license and vehicle types, the system's simplicity is reduced.
    - Assigning a permanent weight to each vehicle simplifies the system for users and regulators while it eliminates weight-based evasion.
    - The elimination of time licenses shows that the simplicity of the system (even at the cost of exempting some users) is more beneficial than trying to make it very detailed as to capture every possible user type as this adds complexity, and increases management and enforcement costs.
- Euro-Vignette
    - A time-based pricing scheme like this does not offer as direct a link between road charges and actual road consumption as a distance-based scheme would, and it represents an inefficient option for short-time users (needing less than the minimum of one-day). However, implementing a similar system would still be an improvement to traditional road funding and the operation costs would be significantly lower than those of a distance-based system.

[224] "Russia invests in ITS technology," ITS International, http://www.itsinternational.com/sections/comment-interview/interviews/russia-invests-in-its-technology/
[225] Research Board, International Perspectives, 73
[226] Ibid.
[227] Research Board, International Perspectives, 53

- One problem with this approach is that Vignettes are especially subject to evasion as random checks are the only way to verify their compliance.

- Germany
  - Germany's geographic location subjects it to significant traffic from foreign trucks, as much as 35% of total truck traffic.[228] Because prior to the implementation of the pricing scheme those trucks were exempted from German traffic taxes, the German trucking industry felt that the new system would be fairer to domestic trucks. That was an important element on their support of the pricing scheme[229].
  - Following up on the point above, a clear rationale and objectives agreed upon by all stakeholders are key to the success of a pricing model. [230] In Germany's case, the desire to level the playing field for domestic trucks by charging foreign trucks, and the fact that the system's revenues were agreed to be earmarked for transportation spending served to gain the trucking industry's acceptance.
  - Even though political actors are clearly an important element of the equation, political interests should not be allowed to interfere with agreed-upon principles and objectives as this erodes stakeholders' support for future projects. In Germany, the federal government has unilaterally diverted some of the system's revenues away from transportation against what it was agreed prior to the system's development[231].
  - The magnitude and complexity of the scheme need to be the drivers for the determination of a realistic implementation schedule.[232] In Germany, an underestimation of the system's complexity lead to a rushed departure from the Euro-Vignette, which combined with a delay of the system's implementation, caused a significant revenue loss because trucks rode for free as there was no system in place to charge them[233].
  - Privacy concerns related to data protection and security need to be fully addressed as part of system design and implementation.

- Switzerland
  - The Swiss Heavy Vehicle Fee (HVF) represents a perfect application of the "user pays" and the "polluters pay" principles by internalizing all the road freight costs, including externalities.
  - Because the HVF was implemented in combination with an increase in the maximum allowed weight, the scheme not only reduced truck traffic and increased revenues that allow the Swiss government to gradually shift from truck to rail traffic, but it also increased efficiency.

[228] Humphrey, Tolling in Germany,8
[229] Research Board, International Perspectives, 46
[230] Humphrey, Tolling in Germany,8
[231] Ibid, 9
[232] Humphrey, Tolling in Germany,10
[233] Ibid, 8

- Including the emissions category as part of the toll calculation served to stimulate a renovation of the truck fleet, thus reducing the total volume of truck emissions.

The pricing schemes presented in this report show that technical solutions are available and that technology is no longer an impediment for the implementation of large-scale road charge systems.

V. Relevance to Texas

The pricing schemes presented in this report were selected because they were considered to provide important lessons to a potential pricing scheme in Texas. The most important characteristics and experiences from such schemes were summarized in the previous section. This final section serves to provide additional insights and recommendations.

It is important to highlight that the German Heavy Goods Vehicle (HGV) tolling system is, at the time of this writing, the largest, most complex (it includes foreign trucks), and the most technologically advanced (GPS, GSM, OBUs and DSRC),[234] with a multi-factor toll rate basis (distance-based, road type, and vehicle's number of axles and emission level). Therefore, it is a good example for any agency considering the implementation of a large-scale pricing scheme. Besides, with TxDOT's goal the same as Germany's—seeking to raise additional revenues to account for truck marginal road consumption—the author considers that Germany's model should be the main example to consider when TxDOT is ready to proceed.

Additional recommendations and thoughts include the following:

- The American Trucking Association (ATA) has expressed as early as 2005 that they would be open to consider pricing if it is a voluntary scheme and alternate routes are available for those who can't pay. Their main concerns include the perception of pricing as a type of double tax, and the possibility of having the revenues from the pricing scheme funneled into general funds or other not-transportation funds. Besides, they say truckers already have an incentive to avoid peak travel. They also said that having incentives to improve their truck's productivity, e.g., adjusting truck's size/weight limits (like in Switzerland), would help diminish industry's opposition to pricing schemes.[235] Gaining industry's support is crucial for the proposed system's success; therefore, TxDOT should pay attention to their concerns.
- In the study "Responses of Trucking Operations to Road Pricing in Central Texas," researchers from the Center for Transportation Research (CTR) at the University of Texas at Austin investigated whether the provision of incentives to non-toll truck road users would divert them into a toll road. They found a very strong negative sentiment towards toll roads in general, with very few respondents willing to even answer these questions. But, of those that did respond, the preferred incentive was the provision of a fuel tax refund for the miles traveled on toll roads.[236] This sentiment echoes ATA's concern about double taxation and as such it should be an important element in the discussion and development of any new model.

[234] Humphrey, Tolling in Germany,10
[235] Research Board, International Perspectives, 45-46
[236] Beatriz Rutzen, Jolanda Prozzi and C. Michael Walton, "Responses of Trucking Operations to Road Pricing in Central Texas," University of Texas at Austin Center for Transportation Research, Austin, TX, 2010, x

- In CTR's recently completed "Oversize/Overweight [OS/OW] Vehicle Permit Fee Study," also known as "Rider 36," it was concluded that the state's current OS/OW permit fee structure is inadequate to recover OS/OW truck-related infrastructure consumption costs. This assessment reiterates the need for substantial changes in the way that heavy vehicles are charged for their use of the road system. The report proposed an alternative fee structure model based on vehicle miles traveled (VMT) and on the vehicle's characteristics that exceed legal limits. Such fee structure would have increased permit revenues from$111 million to $521 million in FY2011.[237] When the time comes to assess potential rates for the system, TxDOT should take this report in consideration because of its detailed analysis of truck's road consumption costs.
- Performance measurement is crucial to managing and increasing goal attainment[238] Examples include revenue gains from the system and their use, efficiency increases in the trucking industry, emissions reductions, etc. For this reason, TxDOT should give special importance to keeping track and informing stakeholders and the public about the benefits of the pricing scheme.
- For any future pricing scheme to succeed, TxDOT would need to build coalitions around common-good principles and objectives such as "users pay but also benefit from the payment," or "polluters pay" to gain political and community support.
- With such a volatile political climate nowadays in Texas, TxDOT would do well to clarify from the beginning that whatever is agreed upon needs to be respected for the duration of the system.

[237] Prozzi, Oversize/Overweight, 1
[238] Research Board, International Perspectives,12

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Appendix 4: Memorandum Regarding Overweight Vehicle Penalties and Enforcement

MEMORANDUM

TO:	Phil Wilson, Executive Director John Barton, Deputy Executive Director James Bass, Chief Financial Officer Melissa Silvey
FROM:	LBJ School of Public Affairs - Highway Transportation Funding PRP
SUBJECT:	Overweight Vehicle Penalties and Enforcement
DATE:	02/19/13

At the conclusion of our 2/8 meeting, you requested additional information on effective overweight vehicle penalties and enforcement measures. Specifically, **what is an appropriate penalty to ensure overweight vehicle compliance?**

Oregon is a model for weight distance fee implementation, as the state has focused on an equitable fee structure, a robust enforcement strategy, and appropriate penalties.

Calculating Penalties and Measuring Effectiveness

- A research note from the Center for Urban Studies at Portland State University, Economics of Overloading and the Effect of Weight Enforcement(http://www.pdx.edu/sites/www.pdx.edu.cus/files/DP01-1.pdf), aims to answer this question directly.
    - Calculations for operators' marginal profit for overloading - useful to determine an effective penalty.
- $472 fine for failure to present Oregon Weight Receipt or Tax Identifier ODOT FAQ(http://www.oregon.gov/ODOT/MCT/pages/faq_citations.aspx). Generally IFTA and interstate carriers are fined.
- No fine revenue collected by ODOT. Legislature determines dedication of citation revenue. (Gregg Dal Ponte*)

Enforcement

- Oregon enforcement of penalties occurs through county weigh masters and state motor carrier enforcement officers. Little enforcement by sheriffs, none by state police - decision of who enforces subject to legislative directive. (Dal Ponte)
- New York has failed to enforce Weight Distance Charge, according to Richard Mudge.**
- Allocating resources for mobile weigh stations, patrol units, etc. is essential for effective enforcement.

Evasion

- High evasion rates persist in NY. According to Richard Mudge**, NY's fee structure intact yet has failed to put the resources behind proper enforcement - detection, mobile scales, trooper presence, etc. ATRI study reports up to 50% evasion rate in NY.
- Cambridge Systematics study for Oregon Legislative Revenue Office of Weight Mile Tax evasion in Oregon concluded evasion is about 5% (+/- 2%) - this is lower than evasion for fuel tax. (Dal Ponte)
- Oregon - 9,154 total violations; 685 axle violations; 1,021 gross weight violations; 7,448 bridge formula violations. (FHWA State Enforcement Certification 2012; see attached document).

- Greatest fine is $44,435 when truck is 73 tons over permitted weight. (http://www.oregonlive.com/happy-valley/index.ssf/2011/05/clackamas_county_issues_44435_fine_for_overweight_load.html)

Selected Options for Improving Enforcement

- Use RFID or similar to tag trucks and allow patrol units to monitor via radar gun.
- Use IFTA documentation as measure for weight distance (using gross weight method to simplify).
- CVSA - universal identifier for trucking companies can be altered to be used for individual trucks.

* *Gregg Dal Ponte, administrator - ODOT Motor Carrier Division*
** *Richard Mudge, Vice President at the Delcan Corporation*

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2. HCAS Oregon(http://www.oregon.gov/DAS/OEA/docs/highwaycost/2011report.pdf) - The full report is the HCAS for 2011-2013 legislature.
5. Economics of Overloading and the Effect of Weight Enforcement (http://www.pdx.edu/sites/www.pdx.edu.cus/files/DP01-1.pdf) - Includes equation of net operating profit for overloading carriers as basis for considering fee structures.
6. New York State Ton-Mile Tax Analysis: Estimation of Untaxed Commercial Vehicle Miles Traveled(http://www.atri-online.org/research/results/economicanalysis/nytmtanalysisv9.pdf): provides an estimate of what New York “should” be collecting.