Intelligent Transportation Systems: From Hometown Solutions to World Leadership

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I. Introduction

To acknowledge the pervasive reach of intelligent transportation systems (ITS) technology, both in the U.S. and abroad, this note explores ITS from many levels. Primarily, the federal legal framework calling for development and implementation of ITS at the regional level is described and illustrated. Then, choice of technology and technological adaptation are discussed as methods to alleviate privacy concerns implicated by ITS implementation both in the U.S. and the European Union. Next, challenges to ensuring broader interoperability are contemplated by comparing disputes over the use of transponder technology in the U.S. and the European Union. The note concludes with a discussion of the continuing future importance of ITS and the opportunity for the U.S. to catalyze industry innovation making energy efficiency a goal in global ITS development.

At the outset, however, it should be noted that the states spur innovation within the federal framework of the U.S., "serv[ing] as laboratories for the development of new

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social, economic, and political ideas."[1] The Supreme Court made this contention numerous times, affirming that "state innovation is no judicial myth."[2] To a large extent, this spirit of learning from local efforts prompted the exposure of several innovative ITS deployments in the author's home town of Parker, Colorado that follows. Therefore, by looking inward to the States, and outward to the European Union, this note offers diverse examples of ITS innovations that can enhance efficiency and safety in transportation infrastructures, services, and industries across the globe.

II. The Federal Framework for ITS Programs

Federal law mandates the promulgation of regulations by the Secretary of Transportation regarding State management of "highway safety,"[3] "traffic congestion,"[4] "public transportation facilities and equipment,"[5] and "bridges."[6] Congress also prescribed the issuance of "guidelines and requirements for the State development, establishment, and implementation of a traffic monitoring system for highways and public transportation facilities and equipment."[7] States have the right to elect compliance with any of the suggested management systems.[8] Additionally, highway projects funded by federal dollars require the concurrence of the Secretary of Transportation on "installations…promot[ing] the safe and efficient utilization of the highways" approved

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[1] Fed. Energy Regulatory Comm'n v. Miss., 456 U.S. 742, 788 (1982).

[2] *Id.*

[3] Management Systems, 23 U.S.C. § 303(a)(3) (2008). *See also* Highway Safety Programs, 23 U.S.C. §§ 402(a) & 402(b)(3) (calling for the Secretary of Transportation to approve State "highway safety programs" by issuing guidelines regarding "traffic control" and "surveillance of traffic for detection and correction of high or potentially high accident locations;" and § 402(b)(3) encouraging the States "to use technologically advanced traffic enforcement devices").

[4] 23 U.S.C.A. § 303(a)(4).

[5] *Id.* § 303(a)(5).

[6] *Id.* § 303(a)(2).

[7] *Id.* § 303(b).

[8] *Id.* § 303(c).

by "State transportation department[s]."[9] Toward these ends, Congress passed the Transportation Equity Act for the 21st Century (TEA-21), providing that the Secretary of Transportation develop a "National ITS Program Plan."[10] TEA-21 called for the establishment of "National Architecture and Standards" to "promote interoperability among, and efficiency of, intelligent transportation system technologies implemented throughout the United States."[11]

Accomplishing these goals and mandates are ITS, traffic monitoring tools defined in federal regulations promulgated by the United States Department of Transportation (USDOT) as, "electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system."[12] The USDOT has developed the National ITS Architecture as "a common framework for ITS interoperability."[13] The National ITS Architecture consists of standards that ensure interoperability between the various ITS systems.[14] The USDOT ITS Joint Program Office works with "Standards Development Organizations" to develop useful ITS standards.[15]

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[9] 23 U.S.C. § 109(d) (2005).
[10] Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, § 5205, 112 Stat. 107, 455 (1998).
[11] *Id.* § 5206(a)(2), 112 Stat. 107, 456.
[12] 23 C.F.R. § 940.3 (2008).
[13] *Id.*
[14] U.S. Department of Transportation, *ITS Standards* (2007), http://www.iteris.com/itsarch/html/standard/standard.htm.
[15] *Id.* (explaining that the following Standards Development Organizations participate in setting standards that will also accommodate technological innovation: AASHTO (American Association of State Highway and Transportation Officials), ANSI (American National Standards Institute), APTA (American Public Transportation Association), ASTM (American Society for Testing and Materials), IEEE (Institute of Electrical and Electronics Engineers), ITE (Institute of Transportation Engineers), NEMA (National Electrical Manufacturers Association), SAE (Society of Automotive Engineers), and ISO (International Organization for Standards)). *See also* Research and Innovative Technology Administration, U.S. Department of Transportation, *ITS Standards Program* (2008), http://www.standards.its.dot.gov/ (providing information on current ITS standards).

The USDOT further prescribed the development of regional ITS architectures.[16] Regional ITS architectures articulate: regional geographic contours;[17] "participating agencies and other stakeholders;"[18] allocation of responsibility among the various actors via "operational concept[s];"[19] agreements on "project interoperability, utilization of ITS related standards, and the operation of the projects;"[20] system requirements;[21] interface and communication requirements;[22] "ITS standards supporting regional and national interoperability;"[23] and project implementation sequencing.[24] Developers seeking to maximize the benefits of systems interoperability can download the Turbo Architecture 4.0 software for free.[25] The software "supports development of regional and project ITS architectures using the National ITS Architecture as a starting point."[26]

Public bodies, ranging from State transportation authorities to counties and municipalities, employ ITS.[27] These governmental actors use various technologies, such as video cameras, magnetic sensors, radio frequency communications systems, and

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[16] *See* 23 C.F.R. § 940.9(a) (2008) (calling for participation by: "[h]ighway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; Federal lands agencies; State motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration.").

[17] *Id.* § 940.9(d)(1).

[18] *Id.* § 940.9(d)(2).

[19] *Id.* § 940.9(d)(3).

[20] *Id.* § 940.9(d)(4).

[21] *Id.* § 940.9(d)(5).

[22] *Id.* § 940.9(d)(6).

[23] *Id.* § 940.9(d)(7).

[24] *Id.* § 940.9(d)(8).

[25] U.S. Department of Transportation, *Turbo Architecture* (2007), http://www.iteris.com/itsarch/html/turbo/turbomain.htm.

[26] *Turbo Architecture*, *supra* note 25.

[27] *See* Town of Parker, Colorado, *Traffic Signal Information* (2008), http://www.ci.parker.co.us/public_works/roads_traffic/traffic_signals.aspx (indicating, in text and graphical illustration, the interplay of state, county, and town ownership and operation of traffic signals in the Town of Parker, Colorado); *see also* NAVTEQ, http://www.navteq.com (2008) (select the "In the Field" option on the interactive panel) (showing an example of a private company that provides similar services by deploying mobile data collection facilities or "geographic analysts" and touting itself as the top driver of European and North American in-vehicle navigation systems, routing websites, and wireless devices with its traffic information).

satellite technology to collect data on infrastructure use and congestion.[28] To enhance roadway efficiency, the information collected is processed and ultimately shared with the public through the media, like State transportation department websites[29] and "dynamic message signs."[30]

III. Developing and Implementing Regional ITS in Colorado

Consistent with USDOT regulations, development of ITS architectures occurs at the regional level.[31] State transportation plans and the National ITS Architecture guide the development process.[32] Regional ITS plans are limited by the financial investments that the participating entities can provide.[33] Thus, regional ITS architectures may cross municipal boundaries[34] or even span state lines.[35] And, when federal agencies are

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[28] *See generally* FEDERAL HIGHWAY ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION, FREEWAY MANAGEMENT AND OPERATIONS HANDBOOK § 15.2 (2006), http://ops.fhwa.dot.gov/freewaymgmt/publications/frwy_mgmt_handbook/fmoh_complete_all.pdf.

[29] *See id.* at 15.4.2 (describing "Washington State DOT Road Weather Information for Travelers," *available at* http://www.wsdot.wa.gov/traffic/); *see also* Colorado Department of Transportation, *Traveler Information* (2008), http://www.cotrip.org/ (providing comprehensive traffic and road conditions data).

[30] *See* RESEARCH AND INNOVATIVE TECHNOLOGY ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION, SURVEY RESULTS (2008), *available at* http://www.itsdeployment.its.dot.gov/SurveyOutline1.asp?SID=am (citing the various types of information relayed to the public through dynamic message signs, including: travel time, incident information, and weather alerts).

[31] *See* 23 C.F.R. § 940.9.

[32] *See id.* § 940.9(a).

[33] *Id.*

[34] *See* DENVER REGIONAL COUNCIL OF GOVERNMENTS, DENVER REGIONAL INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLAN 15-21 (2007).

[35] *See* Conservation Law Found. v. Fed. Highway Admin., No. 06-CV-45-PB, 2007 WL 2492737, at *15 n.25 (D.N.H. Aug. 30, 2007) (describing "a cooperative program being undertaken by New Hampshire, Maine, and Vermont to develop a regional traveler and tourism information system comprising databases containing construction, incident, accident, delay, tourism event information, weather conditions, and a system providing for public access to these information databases on the Internet."); *see also* Edwards & Assoc., Inc. v. Black & Veatch, L.L.P., 84 F. Supp. 2d 1182, 1185 (D. Kan. 2000) (describing the "Kansas and Missouri Departments of Transportation…study assess[ing] transportation needs in the Kansas City metropolitan area" that "address[ed] those needs through deployment of an intelligent transportation system (ITS)" toward "mak[ing] traveling safer and more efficient by utilizing technology such as roadway sensors and cameras to monitor traffic and to alert drivers of problems, hazards or other delays."); Lockheed Martin IMS Corp. v. Delaware Dept. of Transp., No. 15626-NC, 1997 WL 252641, at *1-*2 (Del. Ch. May 5, 1997) (concerning the Delaware Department of Transportation (DelDOT) entering the New Jersey Consortium (New Jersey Highway Authority, New Jersey Turnpike Authority, Port Authority of New York and New Jersey, and South Jersey Transportation Authority) to implement an electronic toll collection system).

involved in the development process, ITS deployments must be considered among other alternatives as prescribed by the National Environmental Policy Act.[36]

To further illustrate the translation of federal policy and regulations into local implementation, the experiences of the Colorado Department of Transportation (CDOT); the Denver Regional Council of Governments (DRCOG); Douglas County, Colorado; and the Town of Parker, Colorado are described here. Primarily, the CDOT and the Transportation Commission of Colorado divided the State of Colorado into fifteen distinct "Transportation Planning Regions."[37] Municipalities outside these metropolitan areas may form "Regional Planning Commissions" by executing "intergovernmental agreements."[38] The "Greater Denver Metropolitan Planning Region" encompasses the governments comprising the DRCOG.[39] Thus, the States dominate the articulation of regional geographic definitions and identification of the relevant actors.[40]

In Colorado, the separate planning entities, like DRCOG, provide substantial guidance for its member municipalities in complying with the USDOT ITS framework regulations.[41] The DRCOG is a "nonprofit association of [fifty six] local governments… dedicated to making the nine-county Denver Region a great place to live, work and play."[42] In accomplishing its "focus on quality-of-life issues...includ[ing] mobility...

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[36] National Environmental Policy Act, 42 U.S.C. § 4332 (2004); *Conservation Law Found*, 2007 WL 2492737, at *15 (accounting ITS deployment as one of many other "Transportation System Management" techniques considered, including: no action, widening highways, and enhancing alternative mass transportation systems).

[37] 2 COLO. CODE REGS. § 604-2(IV)(A) (2008), *available at* http://www.dot.state.co.us/Rules/STIP_Rule_8-17-06_web.pdf (describing the geography of "Transportation Planning Region Boundaries").

[38] *Id.* § (IV)(B).

[39] *Id.* § (IV)(A)(2).

[40] *See* 23 C.F.R. § 940.9(d)(1)-(2).

[41] *See id.* § 940.9(d)(3)-(8).

[42] Denver Regional Council of Governments, *What is DRCOG?* (2008), http://www.drcog.com/index.cfm?page=WhatisDRCOG?.

[and] planning for the future,"[43] DRCOG developed the "Denver Regional Intelligent Transportation System (ITS) Strategic Plan" and an "ITS Architecture for the Denver Regional Area."[44] The Strategic Plan suggests technology to "improve traffic flow and transit trips" and "provide[s] the basis for funding decisions regarding…deployment," while the Regional Architecture "define[s] the technical and institutional relationships among transportation related agencies" to achieve interoperability of systems in the Denver region.[45]

Douglas County then relies on road sales and use tax revenue as the primary financial basis for transportation projects in its jurisdiction.[46] Inter-government revenue and grants from state and federal governments, along with road and bridge property taxes and developer contributions round out the financial basis.[47] As an illustration, $9.6 million in improvements to Lincoln Avenue in Parker, Colorado were contributed by: Douglas County ($6.5 million); the town of Parker and developers, including a local charter school ($2.65 million); and Urban Drainage ($.45 million).[48] The high reliance on tax revenue helps the county leverage State and Federal funding in order to construct "new and improved roads and transportation systems," like the town of Parker ITS.[49]

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[43] Denver Regional Council of Governments, *About DRCOG* (2008), http://www.drcog.com/index.cfm?page=AboutDRCOG.

[44] Denver Regional Council of Governments, *Intelligent Transportation Systems* (2008), http://www.drcog.com/index.cfm?page=IntelligentTransportationSystems (containing links to both documents).

[45] *Id.* (noting that both these documents are in the revision process and will be reviewed in December 2007).

[46] *Capital Improvement Program Progress Report at a Glance*, 2 DOUGLAS COUNTY CONNECTION 1, 2 (Spring 2007), *available at* http://www.douglas.co.us/publicworks/engineering/documents/DCPWInMotionfinal.pdf.

[47] *Id.*

[48] *Id.* at 4.

[49] *Id.* at 3.

Continued tax revenue helps "[provide] state-of-the-art transportation systems that ensure mobility for this vital sector of [the] community."[50]

In the Town of Parker, Colorado, CDOT, Douglas County, and the Town of Parker (Parker) itself have invested in ITS deployed at the numerous intersections within the municipal boundaries.[51] Parker also manages ITS equipment under CDOT jurisdiction.[52] Parker leverages its investment in ITS by using the same video data for traffic detection and equipment malfunction detection.[53] Much like Parker, Douglas County controls traffic signals with a central computer system receiving real time video data via fiber optic connections.[54] Video image processing[55] uses data retrieved to adjust signal timing leading to "improve[ed] travel times, reduce[d] delays, and better…traffic volume distribution," as well as "reductions of emissions [and] fuel costs."[56] For instance, when a vehicle approaches an intersection and stops at a red light, a virtual button is pushed that prompts the signal to change according to an analytical algorithm performed by the central computer.[57] The controlling algorithm may prompt a signal change in a matter of seconds, or even produce immediate changes, for example, when

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[50] *Id*. at 4.
[51] Town of Parker, *supra* note 27.
[52] *See* Town of Parker, *supra* note 27 (including a graphical depiction of the management of signals).
[53] E-mail from David Aden, Traffic Engineer, Town of Parker, Colorado, to Joshua Prok, Executive Articles Editor, Transportation Law Journal (Oct. 2, 2008, 5:00 PM) (on file with author).
[54] *See Id.* (referring to the Town's computer system, "Traffic Central," as so called by Mr. Aden, P.E., in a November 2007 interview with the author); DOUGLAS COUNTY, COLORADO, TRANSPORTATION CAPITAL IMPROVEMENTS PROGRAM: PROGRESS REPORT 1996 THROUGH 2006, 16 (2007), *available at* http://www.douglas.co.us/publicworks/engineering/documents/DouglasCountyReportfinal.pdf.
[55] FEDERAL HIGHWAY ADMINISTRATION, U.S. DEPT. OF TRANSP., FREEWAY MANAGEMENT AND OPERATIONS HANDBOOK 15.2.6.4 (2006), *available at* http://ops.fhwa.dot.gov/freewaymgmt/publications/frwy_mgmt_handbook/chapter15_01.htm#15-2.
[56] DOUGLAS COUNTY, *supra* note 54, at 17.
[57] *See* Aden, *supra* note 53 (confirming Mr. Aden's explanation of the adaptive signal control process to this author during a November 2007 interview, where a laptop retrieved video of virtual squares that became highlighted as vehicles approached and stopped at the intersection of Colorado Highway 83 and Lincoln Avenue).

the video image processor detects a specific vehicle queue length from the subject intersection.[58]

ITS also serves a "traffic calming"[59] function on Mainstreet in Parker by making the urban core safe and accessible to pedestrians. The solar powered crosswalk warning devices employed on Mainstreet, shown in Figure 1 below, are activated when a pedestrian pushes a button attached. These devices are particularly innovative because they don't rely on energy from the existing electrical grid. Parker has eliminated these features during recent improvements, however, by installing traditional streetlights at this intersection.

Figure 1: Recent Photograph of Solar Powered Crosswalk Warning Device and Button on Main Street in Parker, Colorado[60]

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[58] *See Id*. (confirming Mr. Aden's description, during a November 2007 interview with the author, of the functioning of another video image processor located southward of the intersection of Colorado Highway 83 and Arapahoe Road (north of the Douglas County line in Arapahoe County, Colorado), a particularly busy traffic point prone to congestion and long lines). *See also* Arapahoe County, *Managing Transportation Systems*, (2004), http://www.co.arapahoe.co.us/departments/pw/transportaionplan/emergingtechnologies/managetranssys.asp (providing information on the county's ITS deployments).

[59] Timothy Beatley, Green Urbanism: Learning from European Cities 139-44 (2000).

[60] Photograph by Joshua Prok, Executive Articles Editor, Transportation Law Journal, at Parker, Colorado (2008).

IV. Choosing and Adapting Technology to Protect Motorist Privacy

Gathering and sharing traffic data necessarily involves monitoring individual activities and implicates privacy concerns.[61] Not surprisingly, "the original legislation that established the [ITS] program required…develop[ment] in light of concerns about privacy."[62] Additional federal legislation, the Driver's Privacy Protection Act[63] for example, "restricts the availability of personal information identifying an individual without the consent of the individual."[64] The statute protects, among other things, the driver's photograph.[65] State statutes generally offer more protection than the federal law, restricting misuse of remote cameras for example.[66] But, given the modern prevalence of ITS in the U.S., and the federal government's efforts to maintain and coordinate ITS archival data, motorist privacy is potentially imperiled more than ever.[67] Recent concerns over homeland security suggest that ITS may be increasingly adapted for law enforcement and intelligence purposes.[68]

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[61] Dorothy J. Glancy, *Privacy on the Open Road*, 30 Oh. N U L. Rev. 295, 296 (2004).
[62] *Id*. at 369 (citing Pub. L. No. 102-240, § 6054, 105 Stat. 2189 (1991); Norman Y. Mineta, *Transportation, Technology and Privacy*, 11 SANTA CLARA COMPUTER & HIGH TECH. L. J. 3 (1995)).
[63] 18 U.S.C. §§ 2721–2725 (2000).
[64] Glancy, *supra* note 61, at 370.
[65] *Id*. (quoting 18 U.S.C. § 2725(3)).
[66] *Id*. at 373-74 (citing CAL. CIV. CODE § 1708.8(b) (Deering 2008)) (noting that the California Code created a "constructive invasion of privacy" cause of action).
[67] *Id.* at 296 (describing the effect of federal funding to increase ITS deployments and the "archived data user service" that stores information on individual motorists).
[68] *Id.*

Figure 2: "Inductive Loop Detector System"[69]

Technological advances have moved ITS away from reliance on impersonal techniques that maintained vehicle anonymity.[70] Thus, "inductive loop sensors," illustrated above in Figure 2, once embedded in roadways to detect the presence of the conductive metal undercarriages of over-passing vehicles, have been replaced by video image processors.[71] Moving away from technology embedded in the road avoids labor costs incurred during regular roadway maintenance, including periodic resurfacing.[72] Despite these cost savings, however, video image processing potentially enables targeted surveillance.[73]

After all, surveillance video has evidentiary value in some jurisdictions.[74] For the

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[69] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.6.1 (Figure 15-1).

[70] Glancy, *supra* note 61, at 302.

[71] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.6.1; Aden, *supra* note 53 (accounting the Town of Parker's experience moving from inductive loop sensors to video image processing).

[72] *See* Aden, *supra* note 53 (describing the change to video image processing as a way to prevent installation costs associated with cutting asphalt or concrete to embed the inductive loop sensor each time the roads are resurfaced, typically every few years). Reliance on video image processing has the disadvantage of decreased functionality in the snow, which is an annual problem in Colorado. *Id. See also* FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.6.9 (Table 15-2 & 15-3) (describing the required pavement cut as a weakness of inductive loop sensors, while identifying inclement weather effects and lens maintenance requirements as weaknesses of video image processors. Additionally, indicating that inductive loop systems have low purchase costs, while video image processors' "multiple lane, multiple detection zone data" collection capability may balance its higher purchase cost).

[73] Glancy, *supra* note 61, at 303-04.

[74] Tracy Bateman Farrell, Annotation, *Construction and Application of Silent Witness Theory*, 116 A.L.R. 5th 373, 384 (2004) (stating that "automatic camera or video surveillance system" footage has evidentiary value in jurisdictions ascribing to the silent witness theory that require foundation evidence on the reliability of the photographic process).

Town of Parker, however, the limitations of its chosen technology largely remove the possible risks to motorist privacy normally associated with video systems.[75] As this author can attest to, the Parker equipment produces grainy, monochrome video feedback.[76] The video data provided, therefore, makes it nearly impossible to identify vehicle make, model, and color, let alone the driver's identity or license plate information; thus, the secondary detection function of Parker's video "traffic detection equipment" is limited to spotting equipment malfunctions.[77]

Greater motorist privacy implications arise, however, when agencies deploying ITS choose more sophisticated video systems that produce better quality, color feedback, including "pan/tilt/zoom equipment."[78] Such "pan & tilt" closed circuit television platforms allow operators 360 degree viewing capability along an azimuth axis and a ninety degree vertical adjustment range.[79] These units are typically housed in dome enclosures to enhance aesthetics and increase pan and tilt speeds,[80] as illustrated below.[81] "Color cameras have a distinct advantage over monochrome cameras in providing color information that can aid incident verification, assessment and management," creating feedback with higher evidentiary value.[82] These systems can be programmed to restrict their purview, with lens presets and reset functions.[83] Additionally, the video feedback may be edited to preserve motorist privacy.[84]

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[75] Aden, *supra* note 53.
[76] *Id*.
[77] *Id*.
[78] *Id*.
[79] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.9.3.
[80] *Id*.
[81] *See infra* Figure 3.
[82] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.9.1.
[83] *Id*. at § 15.2.9.3.
[84] *See* Aden, *supra* note 53 (confirming Mr. Aden's explanation, during a November 2007 interview with the author, that areas of enhanced video feedback may be "blurred" to alleviate privacy concerns).

Figure 3: Dome-Enclosed Surveillance Camera at the University of Denver Light Rail Station[85]

ITS employing automatic vehicle identification (AVI) technology also facilitate "target[ing] and track[ing] specific vehicles and the individuals in them."[86] As an example of AVI in enforcement applications, digital cameras perform license plate recognition by associating photographic data with vehicle and owner records in computerized databases.[87]

Radio frequency identification devices (RFID) provide another example, consisting of a radio transmitter installed in a vehicle that communicates a unique frequency to a roadside communication unit.[88] Commonly referred to as transponders, this technology is often used in electronic toll collection systems (ETC) in the U.S.[89] Transponder technologies vary according to the type of information stored by the in-vehicle unit and the type of communication interface with the receivers installed in the infrastructure.[90] ETC systems may exact fixed tolls or enable dynamic pricing that

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[85] Photograph by Joshua Prok, Executive Articles Editor, Transportation Law Journal, at Denver, Colorado (2008).

[86] Glancy, *supra* note 61, at 296.

[87] *Id*. at 305.

[88] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.7.1; Dorothee Heisenberg, NEGOTIATING PRIVACY: THE EUROPEAN UNION, THE UNITED STATES, AND PERSONAL DATA PROTECTION, 150 (2005).

[89] FEDERAL HIGHWAY ADMINISTRATION, *supra* note 28, at § 15.2.7.1.

[90] *Id*. The Federal Highway Administration further classifies transponders into three classes:

> Type I. Type I transponders are read-only tags that contain fixed data, such as a vehicle identification number. They can initially be programmed either at the manufacturing facility or by

adjusts toll rates to maintain efficient traffic flow.[91]

In 2004, a "Federal Communications Commission [(FCC)] Report and Order" defined a bandwidth[92] for Dedicated Short Range Communications (DSRC) in ITS Applications.[93] DSRC systems are more powerful and sophisticated two-way communications devices similar to RFID technology.[94] The FCC, however, denied DSRC the same privacy protection enjoyed by wireless telephone communications as "customer proprietary network information" under federal law.[95] Several state statutes pertaining to electronic tracking devices, however, provide more protection for motorists than federal law.[96] This pattern led a learned commentator to conclude that "considerable uncertainty remains about the privacy of the new ITS communications applications" in

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> the agency issuing the transponder; however, they cannot by reprogrammed without returning the transponder to the manufacturer.
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> Type II. These transponders have read/write capability. In these transponders, some of the memory contains permanent information (such as vehicle identification number) and cannot be reprogrammed. However, additional memory can be provided and may be reprogrammed or written remotely from the reader. This type of transponder is typically used in toll systems to record time, date, and location of entry, and account balance for vehicles.
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> Type III. These transponders are also known as "smart cards." They have extended memory and are capable of full two-way communication. With this system, vehicles can be warned of incidents, congestion, or adverse weather conditions, enabling drivers to take alternative routes. This type of system requires sophisticated technology for both the roadside and vehicle-based equipment. *Id.*

[91] Federal Highway Administration, U.S. Department of Transportation, *Frequently Asked Questions, Congestion Pricing: A Primer*, http://www.ops.fhwa.dot.gov/publications/congestionpricing/sec7.htm. Concerning dynamic pricing, the Primer goes on to say:

> tolls are continually adjusted according to traffic conditions to maintain a free-flowing level of traffic. Under this system, prices increase when the tolled lane(s) get relatively full and decrease when the tolled lane(s) get less full. The current price is displayed on electronic signs prior to the beginning of the tolled section. This system is more complex and less predictable than using a fixed-price table, but its flexibility helps to consistently maintain the optimal traffic flow. Motorists are usually guaranteed that they will not be charged more than a pre-set maximum price under any circumstances. *Id.*

[92] Glancy, *supra* note 61, at 311 (explaining, "[t]he FCC Order allocates to Intelligent Transportation Systems radio frequencies between 5.850 and 5.925 GHz and adopts the ASTM E2213-03 (ASTM-DSRC) communications standard that extends wi-fi (IEEE standards 802.11 and 802.11a) to vehicles traveling at high speeds").

[93] *Id.* at 372.

[94] *Id.* at 311; Elizabeth E. Joh, *Essay: Discretionless Policing: Technology and the Fourth Amendment*, 95 Cal. L. Rev. 199, 217 (2007).

[95] Glancy, *supra* note 61, at 312, 372-73 (citing 19 F.C.C.R. 2458 (2004) & 47 U.S.C. § 222(h)(1) (2008)).

[96] *Id.* at 373.

the U.S.[97]

As technological advances persist, the U.S. continues to take a reactive, sectoral regulatory approach to privacy.[98] The resultant situation of flux and uncertainty contrasts with the situation in the European Union where the member states "think proactively about privacy threats entailed in new technology, and…regulate the technology before privacy abuses occur."[99] The "Directive on the Protection of Individuals With Regard to the Processing of Personal Data and on the Free Movement of Such Data" (Data Protection Directive) provides for the protection of individuals' "right to privacy, with respect to the processing of personal data" in the Member States.[100] "Controllers," or privacy agencies, assure compliance with the Data Protection Directive in each Member State.[101] This proactive approach, as applied to ITS, led to an interpretation of the Data Protection Directive as encompassing protection of individuals' license plate numbers in France.[102]

Pertaining to RFID in commercial applications, "European [entities deploying the technology] assume that they will be bound" to comply with the Data Protection Directive.[103] When the inclusion of RFID technology into passports was mandated by the International Aviation Organization, for example, Europeans accordingly encrypted the

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[97] *Id.*

[98] *See* HEISENBERG, *supra* note 88, at 139; PETER B. MAGGS, ET AL., INTERNET AND COMPUTER LAW 663 (2nd ed. 2005) (describing Congress' sectoral approach to privacy law as "a variety of legislation in response to the problems posed by improvements in the collection and distribution of information about individuals").

[99] HEISENBERG, *supra* note 88, at 139.

[100] Council Directive 95/46, art. 1, 1995 O.J. (L 281) 31, 38 (EC), *reprinted in* MAGGS ET AL., *supra* note 98, at 722.

[101] Council Directive 95/46, art. 6, at 40, *reprinted in* MAGGS ET AL., *supra* note 98, at 722-23.

[102] Glancy, *supra* note 61, at 305.

[103] HEISENBERG, *supra* note 88, at 140.

data signals.[104] The U.S. government, however, proposed passport production without encryption.[105] Thus, without an overarching proactive mandate to protect individual data, U.S. passport data is theoretically retrievable by anyone able to get an RFID scanner within the frequency range of the embedded radio signal.[106] Accordingly, compromised RFID communications may be required before U.S. law reacts with protective solutions.[107] Meanwhile, individuals in the U.S. must request that agencies take protective measures while deploying RFID to communicate their personal data, such as assigning anonymous account identification information to their electronic toll transponders.[108]

V. Other Challenges to Achieving ITS Interoperability

Interoperability concerns were a major stumbling-block for the deployment of smart cards in ETC systems for congestion pricing in the Netherlands.[109] The Dutch system contemplated that "[d]rivers would insert the cards and the amount of the fare would be automatically deducted from the card as the cars pass under electronic scanning devices," or otherwise video of the driver's license plates would be used to assess periodic tolls.[110] Dutch ITS deployers worried that German motorists, for example, would get a free ride through the system if a German license plate could not be

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[104] *Id.*
[105] *Id.*
[106] *Id.* (noting a common thirty foot transmitter frequency range).
[107] *See id.*
[108] *See Frequently Asked Questions*, *Congestion Pricing: A Primer*, *supra* note 91 (stating that tolling would not invade privacy as "[t]olling agencies have devised a method to protect the public's privacy by linking the transponder and the driver's personal information with a generic, internal account number that does not reveal the driver's identity and that is not disclosed to other organizations" or "a motorist can open an anonymous account if he or she so chooses.").
[109] BEATLEY, *supra* note 59, at 158-60.
[110] *Id.* at 159.

recognized and the toll would be left uncollected.[111] An analogous concern in the U.S. manifests when unregistered immigrants drive unregistered vehicles through ETC systems.

As previously explained, the federal government sought to solve the free rider problem by establishing the National ITS Architecture to achieve the goal of interoperability: coordination and communication amongst the various agencies deploying ITS technology.[112] Toward realizing the pervasive ITS deployment envisioned by the federal government, American businesses compete aggressively, even in the courts, for contracts to deploy transponder technology on behalf of State agencies.[113] But, government and business entities have also clashed over access to resulting ITS architectures in the U.S., specifically over access to transponder architectures.[114]

In *Oregon v. Heavy Vehicle Elec. License Plate, Inc.* (HELP), the State of Oregon sought access to a multi-state RFID system created by HELP, a non-profit corporation.[115] The RFID system was technically interoperable with the motor carrier identification system operated by the Oregon Department of Transportation (ODOT).[116] HELP licensing agreements, however, prevented its transponders' use "in non-HELP systems, absent advance approval."[117] Divergent fee collection methods and "availability of the information processed during" transponder communication led to failed negotiations and

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[111] *Id.* at 160.

[112] *See* 23 C.F.R. § 940.3 (2008).

[113] *See* Lockheed Martin IMS Corp. v. Delaware Dept. of Transp., No. 15626-NC, 1997 WL 252641, at *1-*6 (Del. Ch. May 5, 1997) (where the Delaware chancery lacked jurisdiction to rule on Lockheed's complaint regarding the Delaware Department of Transportation's use of New Jersey procurement procedures regarding a project connected to the New Jersey Consortium, because Lockheed had a remedy in New Jersey).

[114] *See* Oregon v. Heavy Vehicle Electronic License Plate, Inc., 198 F. Supp. 2d 1202, 1204 (D. Or. 2002) [hereinafter *HELP*].

[115] *Id.*

[116] *Id*. (describing the HELP "PrePass" and "Green Light Program" transponder systems).

[117] *Id*.

brought the parties to court.[118] The court found Oregon's general policy favoring ITS interoperability lacked "clearer establishment" and "justification of its critical importance—from the Oregon legislature" that could have provided the State a right to utilize the HELP transponders.[119] The court further legitimized the HELP restriction clauses to protect its investment and denied ODOT's request for declaratory relief regarding "misappropriation, conversion, tortuous interference with an economic relationship, or any other tort."[120]

Instead of reactively resolving disputes, the Member States of the European Union, have worked proactively to establish international ETC system legislation.[121] Specifically, the Commission contemplates an "European service" built on an "obligation for operators to make interoperable receivers available to users who want them."[122] Acknowledging existing toll collection systems in Rome and London, that control city center access, the Commission directed a progressive migration from ground-based systems to its preferred satellite-based technology.[123]

Such legislation furthers the goal of interoperability while it protects investments in the short to medium term.[124] Similar legislation protects investments that concerned the court in *HELP*, and creates governmental rights that could have resolved the case in Oregon's favor. Thus, the same pattern of European leadership, shown above in regards

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[118] *Id*. at 1204-05 (explaining that the Oregon Department of Transportation charged a $35.00 annual fee and used the transponder data like a traditional weigh station logbook, whereas HELP charged $.99 for each bypass event and limited the information collected to fee processing).

[119] *Id*. at 1209.

[120] *Id*. at 1208-1209.

[121] *See* COMMISSION OF THE EUROPEAN COMMUNITIES, PROPOSAL FOR A DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON THE WIDESPREAD INTRODUCTION AND INTEROPERABILITY OF ELECTRONIC ROAD TOLL SYSTEMS IN THE COMMUNITY, 26 (2003), *available at* http://ec.europa.eu/ten/transport/revision/doc/com_2003_0132_en.pdf.

[122] *Id*. at 27.

[123] *Id*. at 27-28.

[124] *See id*.

to privacy matters, translates to other areas of ITS litigation.

VI. Future U.S. Leadership in ITS

In 1996, Federico Peña, former Secretary of Transportation in the Clinton Administration, set a lofty goal of equipping the "largest metropolitan areas" in the U.S. with "complete intelligent transportation infrastructure" by 2005.[125] Since that time, the Joint Program Office has tracked ITS deployment with national surveys.[126] Survey results from fiscal year 2006 indicated that some fifty-four percent of signals operated in 104 metropolitan areas surveyed enjoy the benefits of closed loop or central system control.[127] The "Pittsburgh, Beaver Valley," Pennsylvania metropolitan area leads the nation with one hundred percent centralized control, while the "Denver, Boulder," Colorado area stands near the national average at fifty-three percent, and "Fresno," California ranks dead last with just seven percent deployment.[128]

The benefits of centralized control are exemplified by the experience of Los Angeles, California, where:

> [t]he Automated Traffic Surveillance and Control Program (ATSAC)…has operated computerized signal control systems since 1984. As of 1994, it included 1,170 intersections, and 4509 detectors for signal timing optimization. It reportedly decreased fuel consumption 13 percent, decreased air emissions 14 percent, reduced vehicle stops 41 percent, reduced travel time 18 percent, increased average speed 16 percent, and decreased delay by 44 percent.[129]

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[125] ITS JOINT PROGRAM OFFICE, FEDERAL HIGHWAY ADMINISTRATION, TRACKING THE DEPLOYMENT OF THE INTEGRATED METROPOLITAN INTELLIGENT TRANSPORTATION SYSTEMS INFRASTRUCTURE IN THE USA: FY2004 RESULTS, 7 (2005), *available at* http://www.itsdeployment.its.dot.gov/pdf2004/metropolitan_summary_report2004.pdf (quoting speech by Federico Peña, former Secretary of Transportation, at the Transportation Research Board in Washington, DC (Jan. 10, 1996)).

[126] *Id*.

[127] Research and Innovative Technology Administration, U.S. Department of Transportation, *Signalized Intersections Under Closed Loop or Central System Control* (2008), http://www.itsdeployment.its.dot.gov/Results.asp?year=2006&rpt=M&filter=1&ID=303.

[128] *Signalized Intersections Under Closed Loop or Central System Control*, *supra* note 127.

[129] Research and Innovative Technology Administration, U.S. Department of Transportation, *Benefits*

Furthermore, motorists and transportation agencies from Florida to Maine, and Tysons Corner, Virginia to London, England all boast benefits from ITS.[130] These remarkable efficiency improvements seem even more important today as the price of oil has skyrocketed to a relatively stable price near three dollars per gallon in the U.S.[131]

Transportation efficiency is not only important to the U.S., however, as the United Nations recently called on the U.S. and China to take more of a leadership role in reducing global climate change.[132] While alluding to the scientific consensus on human contribution to global warming, the Secretary General exhorted the "world's policymakers to…[speak] clearly and in one voice" by capping emissions.[133] As the foregoing data suggests, ITS have proven to be powerful tools to enhance efficiency, and lower emissions.[134]

On a global level, the annual World Congress on ITS has united the international community since its initial meeting in France in 1994.[135] Recently, Beijing hosted the 14th World Congress on ITS, consisting of "administrative and technological sessions, exhibitions, technological studies, interactive sessions, [and] citizen education" on the

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Database (1994), http://www.itsbenefits.its.dot.gov/its/benecost.nsf/0/D09C8BDF23D1A116852569610051E2C5?OpenDocument.

[130] Research and Innovative Technology Administration, U.S. Department of Transportation, *Benefit of the Month*, (2008), http://www.itsbenefits.its.dot.gov/its/benecost.nsf/DisplayXOTM?OpenForm&BOTM^BOTM.

[131] *See* Jad Mouawad, *OPEC Finds Price Range to Live With*, N.Y TIMES, Dec. 6, 2007, at C1, *available at* http://www.nytimes.com/2007/12/06/business/worldbusiness/06opec.html?ref=business.

[132] *Id.*

[133] *Id.*

[134] *See* Research and Innovative Technology Administration, *Benefits Database*, *supra* note 129; *see also* Research and Innovative Technology Administration, *Benefit of the Month*, *supra* note 130.

[135] ITS World Congress 2008, *Info on Past/Future Events* (2008), http://www.itsworldcongress.org/info-on-past-future-events.html.

theme: "ITS for a Better Life."[136] Some 5,000 government and industry registrants attended the event, with a goal of promoting international communication and cooperation on ITS.[137] Future World Congresses to be hosted by the U.S.A. in 2008, Sweden in 2009, and Korea in 2010, show the international community's strong commitment to enhancing ITS.[138]

Paul R. Brubaker's remarks in Beijing showed the visionary leadership of the U.S. in ITS implementation toward achieving the important goals of efficiency and environmental protection:

> In 2025, I can imagine big cities all over the world where traffic flows seamlessly, even in bad weather, even in work zones—on all roads, across all transportation modes, all the time. I can imagine vehicles without tailpipes and those that emit nothing more than water vapor.
>
> I can imagine major highways that are free of crashes, because drivers are warned about current-condition hazards—like fog or icy patches—and quickly re-routed to safer roadways.
>
> I can imagine busy business districts where drivers find parking right away, without circling—a colossal waste of time and fuel.
>
> I can imagine a quiet commute to and from work—because traffic helicopters are no longer hovering to report the bad news about crashes and breakdowns, and people have the information they need to choose the most efficient route, mode, and time of day for travel.
>
> I can imagine freight moving seamlessly across transportation modes to get to its destination on time and keep businesses thriving.[139]

To make this vision a reality, the federal government must continue to enhance the National ITS Architecture by providing federal funding for regional ITS projects, under the Transportation Infrastructure Finance and Innovation Act.[140] Local governments and

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[136] American Association of Highway and Transportation Officials, *AASHTO Participates in ITS World Congress*, AASHTO—NEWS, Oct. 31, 2007, *available at* http://transportation.org/news/79.aspx.
[137] *Id.*
[138] *See* ITS World Congress 2008, *supra* note 135.
[139] Paul R. Brubaker, Administrator, Research and Innovative Technology Administration, U.S. Department of Transportation, *Remarks to 14th World Congress on Intelligent Transportation Systems Ministers Plenary Session Beijing, China* (2007), http://www.its.dot.gov/press/2007/14thcongress_brubaker.htm.
[140] 23 U.S.C. § 602 (2005).

concerned communities can also promote ITS deployment through local tax revenues, similar to the "Road Sales and Use Tax" imposed in Douglas County, Colorado.[141] Cooperative funding by federal and local agencies can enhance the telematics architecture[142] to achieve the full "vehicle infrastructure integration" sought by the ITS Standards Program.[143]

The European Union may also be providing more leadership in the telematics area, especially in regards to integrating satellite technology into ITS deployments.[144] The "GALILEO European satellite positioning system," expected to be operational in 2008, would provide "[m]ore accurate and efficient systems [for] motorists and authorities" regarding:

> - navigation and guidance systems based on digital mapping enhanced by safety information transmitted to drivers on static hazards (black spots, etc.) and dynamic hazards (black ice, dense traffic, etc.) that they are likely to encounter[;]
> - traffic information which can be filtered so as to respond precisely to the needs and situation of drivers[;]
> - accident alert system for the automatic transmission of essential information to the nearest emergency service unit[; and]
> - "tracking", eg monitoring vehicles used for the carriage of hazardous goods, stolen vehicles or vehicles used for criminal activities.[145]

Not surprisingly, the Federal Motor Carrier Safety Administration recently announced a demonstration program to equip U.S. and Mexican trucks with "satellite tracking

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[141] *Capital Improvement Program Progress Report at a Glance*, *supra* note 46, at 2.

[142] Joh, *supra* note 94, at 216 (using the term as, "a catchall . . . to describe the use of telecommunications for sending, receiving, and collecting information. . . . between cars and private or public infrastructures" including RFID and DSRC).

[143] Research and Innovative Technology Administration, U.S. Department of Transportation, *ITS Standards and the USDOT Research Initiatives*, http://www.standards.its.dot.gov/learn_Research.asp#vehicle (last visited Oct. 12, 2008) (listing the baseline standards for deployments under the initiative).

[144] *See Communication from the Commission, European Road Safety Action Programme*, art. 5.3.5, COM (2003) 0311 final (Feb. 6, 2003), *available at* http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=COMfinal&an_doc=2003&nu_doc=311.

[145] *Id.*

technology" and "allow real-time tracking of truck location, documenting every international-border and state-line crossing."[146] The program aims at enhancing compliance with "safety standards and U.S. trade laws."[147] The satellite information will identify only company and vehicle number to maintain driver privacy.[148] Following the European lead, therefore, may provide the federal government another useful tool during the current turmoil over homeland security effects surrounding the porous U.S.-Mexico border.

Using renewable energy to provide more cost-efficiency in powering ITS should be another goal in the U.S. Photovoltaic systems, or solar panels, already provide the "most cost-effective long-term" solutions for electricity generation in "remote location[s] where accessing an electrical grid is infeasible or inexpensive."[149] As of November 2007, the Parker had deployed twenty-six photovoltaic generators to power "school zone safety beacons" and six additional beacons were installed at two new schools within the Town's "ever expanding program" since then.[150] A "commercial two-way paging service" connects the beacons to the town center to ensure they flash only on school days, enhancing motorists' respect for the beacons and their overall effectiveness.[151] Convenience prompted this operating procedure, because installation costs from trenching power lines and connecting to the electrical grid are avoided.[152] Although solar power currently supports limited-capability video image processors, deployment of the

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[146] Office of Public Affairs, U.S. Department of Transportation, *Safety Rules Reinforced with Satellite Technology for Mexican*, *U.S. Trucks Participating in the Cross-Border Trucking Demonstration Project*, (2007), http://www.dot.gov/affairs/fmcsa1107.htm.
[147] Office of Public Affairs, *supra* note 146.
[148] Office of Public Affairs, *supra* note 146.
[149] Suedeen G. Kelly, *Alternative Energy Sources*, in ENERGY LAW AND POLICY FOR THE 21ST CENTURY 13-1, 13-18 & 13-19 (James E. Hickey et al. eds., 2000).
[150] Aden, *supra* note 53.
[151] *Id.*
[152] *Id.*

power source is limited by the higher energy demands of more complex systems.[153] Instead, the current industry trend favors using light-emitting diode (LED)[154] technology, instead of incandescent lights, to make signals more efficient by decreasing electrical consumption by some ninety percent.[155]

Distributed wind systems also provide cost effective renewable energy solutions when coupled with solar and battery systems.[156] Such "hybrid power systems" can be more cost effective than diesel generation.[157] The Environmental Protection Agency (EPA) recommends that Denver continues to pursue distributed micro-turbine wind generation as an alternative fuel, as demonstrated by a project at Police Station #4 in the city.[158] The EPA further touts micro-turbine technology as the "cutting edge…cornerstone in the distributed generation field."[159] By embracing these renewable energy systems, the U.S. can take the lead in decreasing or even eliminating the demands on the electrical grid from ITS deployment.

VII. Conclusion

A recent photograph of the intersection of Main Street and Chambers Road in Parker, shown in Figure 4, illustrates the challenge lying ahead as urban sprawl continues

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[153] *Id.*

[154] Wikipedia.org, *Light-emitting diode*, http://en.wikipedia.org/w/index.php?title=Light-emitting_diode&oldid=244628905 (last visited Oct. 12, 2008) (defining LED as a "semiconductor diode that emits light when an electric current is applied in the forward direction of the device, as in the simple LED circuit").

[155] Aden, *supra* note 53 (confirming Mr. Aden's appraisal of efficiency savings stated to this author in a November 2007 interview); *see also* U.S. Environmental Protection Agency, *Local Action Plan Recommendations Denver, Colorado* (2008), http://yosemite.epa.gov/gw/StatePolicyActions.nsf/LookupLocalExhibits/Colorado+:+Denver (expecting LED retrofitting in Denver to "reduce annual emissions of carbon dioxide by 8,894 tons . . . [the] equivalent to removing 1,094 cars from the road").

[156] Kelly, *supra* note 149, at 13-21.

[157] *Id.*

[158] U.S. Environmental Protection Agency, *supra* note 155; Environmental Quality Division of the Denver Department of Environmental Health, City and County of Denver, *2010 Programs and Plans* (1995), http://www.denvergov.org/ES/SustainableInitiatives/tabid/386886/Default.aspx.

[159] U.S. Environmental Protection Agency, *supra* note 155.

in America. The choice remains to be made whether new development will use renewable energy to power ITS and other technologies at intersections. In this vein, Parker has already employed solar powered crosswalk warning devices and school zone safety beacons, discussed above, to make streets safer for school children and pedestrians. By the admission of its Traffic Engineer, however, Parker made such innovations on the basis of avoiding costs associated with connecting the existing electric grid rather than "going green."[160]

Figure 4: Recent Intersection Infrastructure Construction in Parker[161]

But that is exactly what our nation and world needs to do: go "GREEN."[162] While the U.S. federal government may now be waking up to the efficiency benefits of ITS powered by renewable energy, small towns like Parker are likely ahead in this effort. By embracing the ITS lessons from local governments, and the rest of the world, the federal government can spur more interoperable and energy-efficient development in ITS to make transportation systems more efficient and respectful of motorist privacy, and

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[160] *See* Aden, *supra* note 53 (confirming Mr. Aden's statements to this author in a November 2007 interview).

[161] Photograph by Joshua Prok, Executive Articles Editor, Transportation Law Journal, at Parker, Colorado (2008).

[162] *See* Edward H. Ziegler, *American Cities, Urban Collapse, and Environmental Doom*, 60 PLANNING & ENVTL. L. 7 (Jan. 2008), *available at* http://www.informaworld.com/index/793333601.pdf (calling on the next president to "pledge to be America's first GREEN president").

safer for all who use them. Government agencies need to perform long term economic analyses, therefore, to prove the cost advantages to powering ITS with solar and microturbine generation systems.[163] Parker's experience, as an example, shows that the economic advantages of ITS powered by renewable energy are primary benefits.[164]

The U.S. Congress recently passed energy legislation, namely the Energy Independence and Security Act of 2007,[165] increasing corporate average fuel economy standards to increase efficiency.[166] The bill also called for improvements in "transportation electrification" and provided incentives for "advanced technology vehicles manufacturing."[167] The applicability of these latter provisions to ITS indicates the continuing importance of ITS as a means to the end of enhanced transportation efficiency desired by the American people. More specific legislation, and funding, can commit the U.S. to world leadership in the development and innovation of industries powering ITS with renewable energy. These innovative, efficient ITS solutions will find ready markets for deployment across the globe, especially in ITS World Congress member states.

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[163] *See* Kelly, *supra* note 149, at 13-18 & 13-19.

[164] *See* Aden, *supra* note 53.

[165] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (2007).

[166] *Id.* § 102 (amending 49 U.S.C. 32902(b) (2007) to raise the fuel economy standard to thirty-five miles per gallon by 2020).

[167] *Id.* §§ 131, 136.