Title: TENNESSEE SMARTPARK PILOT

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Status of the project: On going

BACKGROUND: Truck parking is a major problem at the US highways, since there is scarcity in large truck parking facilities along them. The lack of available truck parking areas forces commercial vehicle drivers to drive long distances without resting. In 2007 The Federal Motor Carrier Safety Administration (FMCSA) started the "*SmartPark*" program, which is designed to match demand and supply of truck parking. This initiative relies on the truck parking detector technologies integrated into a real-time truck parking information system for use by truck drivers. A truck parking information system provides the real-time parking availability information to truck drivers using the advanced Intelligent Transportation System (ITS).

THE SMARTPARK PROJECT IN TENNESSEE: The project was split in two phases with durations of 24 and 17 months respectively. Under Phase I of the project, a rest area, located on I-75 northbound (NB) at mile marker (MM) 45 in Athens (TN), was selected to test the feasibility of the used technology. Under Phase II of the project, a rest area, situated southwest of the original location (MM 23), was selected to demonstrate how two adjacent truck parking areas can be linked to divert trucks from a filled parking area to an area with available spaces by providing dynamic real time information.

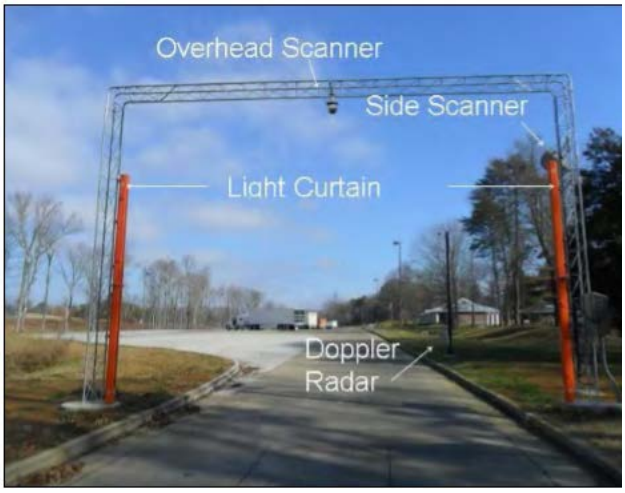

Exhibit 1: SmartPark Detector Configuration

The detection technology used under Phase I includes a Doppler radar and laser scanners (in overhead [OH] and side [SID] configurations) and light curtains (CUR) mounted on gantry structures (**Exhibit 1**). In addition to the detection equipment, the following verification tools were installed: seven closed circuit television (CCTV) cameras; network video recorder (NVR); and a project Website. Findings, revealed under Phase I, indicated that the technology used met the performance requirements. Furthermore, side scanners (SID-SID) with a Doppler radar provided more accurate results. Along with the latter technology, on-site and off-site servers were used under Phase II of the project to distribute parking availability information to truckers.

On-site server stored the following information: 1) detector ID; 2) date and time; 3) vehicle length; 4) profile and class of entering vehicle; 5) number of vehicles in the lot; and 6) a still-image of the detection area. Off-site servers were connected to the on-site server to collect and store the data that could be used to estimate the future parking availability information based on time and date.

SYSTEM OPERATIONAL ANALYSIS: To assess the efficiency and effectiveness of the SmartPark technology implementation in TN, the data suggested by the SmartPark technology were compared against manual counts. The system was evaluated based on the following performance requirements (PR): PR1) evaluate the system as a whole, meaning all system components (e.g., detectors, data collection components, hardware, software, and communications elements); PR2) determine whether the used detector combination can adequately classify vehicles on entry and exit; and PR3) certify that the system is robust enough to operate undisrupted under all environmental conditions. The total error rate in estimation of truck volumes within the rest area was estimated to assess compliance of the available SmartPark technologies to PR1 (**Exhibit 2**). It was found that the total error rate comprised 0.14%,

1.06%, and 0.20% for OH-OH, CUR-OH, and SID-SID combinations respectively. Furthermore, the vehicle classification consistency was calculated to assess compliance of the available SmartPark technologies to PR2 (**Exhibit 2**). Results demonstrated that the OH-OH (with 97.76% classification consistency) and SID-SID (with 97.75% classification consistency) combinations were able to meet the 95% accuracy criterion, while the CUR-OH combination (with 93.46% classification consistency) was not able to meet the 95% accuracy criterion.

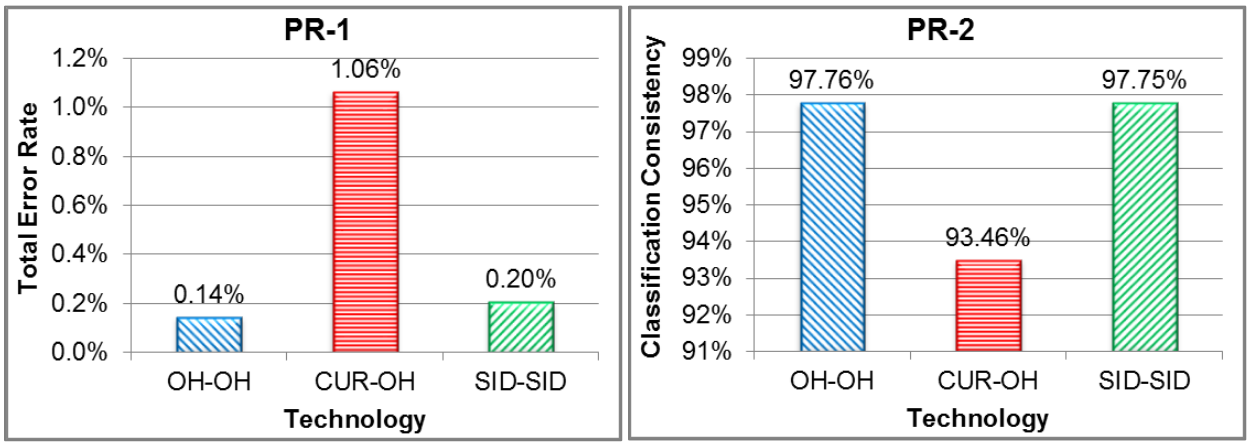

Exhibit 2: Total Error Rate and Classification Consistency by Technology Type

HOURLY LOT OCCUPANCY: The data, collected from the detection equipment can be also utilized to calculate the average hourly lot occupancy. Examples of the average rest area occupancy distributions by day of the week are presented in **Exhibit 3** for [12 am – 1 am] and [1 am – 2 am] time periods. Based on analysis of the available data, it was found that the considered rest area was operating close to its capacity between 11 pm and 7 am most of the days of the week.

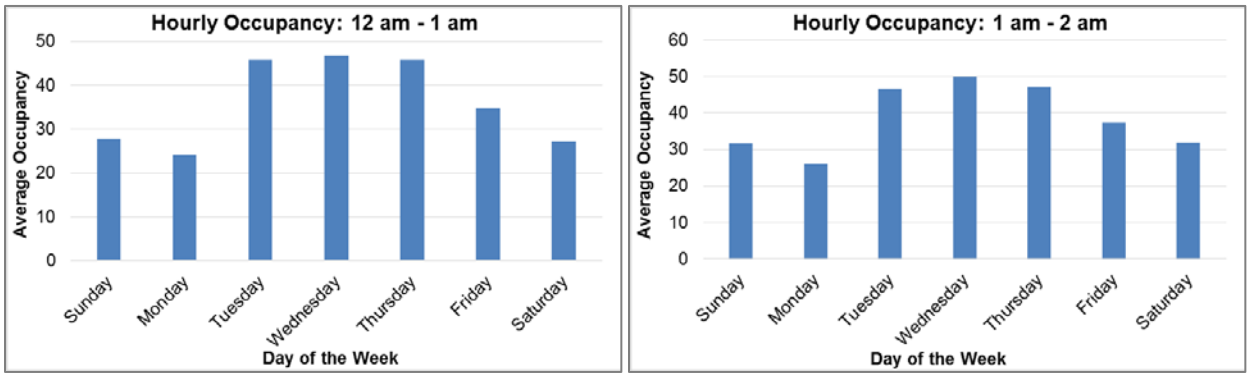

Exhibit 3: Average Rest Area Occupancy by Day of the Week

POTENTIAL FUTURE SMARTPARK LOCATIONS: A total of 11 potential future SmartPark locations were identified by the research team. All of those rest areas met the following two criteria: 1) Another location exists that could be used to connect the selected location; and 2) Both locations should be in the same direction, be accessible from the same roadway and within 35 miles from each other. The Google Earth was used to inspect each location. Some additional criteria were used in selection of the potential SmartPark locations from the preliminary list, including the following: 1) Recently reconstructed site with easily accessible truck parking spaces; 2) Single points of ingress and egress; 3) Separated truck and car parking areas; and 4) Ample lighting for nighttime operations. Locations 41 and 42 meet all the above criteria (**Exhibit 4**). Location 41 is a rest area, located on I-40 in Jefferson County (East of Knoxville). Location 42 is a TN State Welcome Center in Cosby County.

Exhibit 4: Candidate SmartPark Locations: Rest Area 41 (left) and Rest Area 42 (right)

CAPITAL FUNDING OPPORTUNITIES: The Fixing America's Surface Transportation Act (FAST Act) authorizes programs to improve the Nation's surface transportation infrastructure and enhance safety for highways, public transportation, motor carrier, hazardous materials, and passenger rail. The seven programs under FAST Act and their apportionments for the State of TN are shown in **Exhibit 5**. Programs 1, 2, and 7 could provide funding to support a Smart-Park program in TN.

Exhibit 5: FAST Act Apportionments in TN (US Dollars)

Program Name	2016	2017	2018	2019	2020	Total
1. National Highway Performance Program	491,552,314	502,462,014	512,015,897	522,545,255	533,418,054	2,561,993,534
2.Surface Transportation Block Grant Program	245,312,251	251,061,080	256,399,034	260,983,754	266,704,084	1,280,460,203
3.Highway Safety Improvement Program	49,151,643	50,244,109	51,187,585	52,111,169	53,168,467	255,862,973
4. Railway- Highway Crossing Program	4,788,057	4,894,459	5,000,860	5,107,261	5,213,662	25,004,299
5. Congestion Mitigation and Air Quality Improvement Program	36,898,500	37,717,440	38,434,605	39,138,181	39,933,096	192,121,822
6. Metropolitan Planning	4,787,302	4,884,244	4,986,862	5,093,932	5,212,502	24,964,842
7.The new National Highway Freight Program	24,672,946	23,600,209	25,745,682	28,963,893	32,182,103	135,164,833
Total	857,163,013	874,863,555	893,770,525	913,943,445	935,831,968	4,475,572,506

NEXT STEPS: SmartPark user survey (truckers, facility operators/owners, long/short haul companies.