National Deployment Strategy for Truck Stop Electrification

by

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ABSTRACT

Economic factors have helped determined the locations for truck stop electrification (TSE), i.e., where the installations can be subsidized by government agencies and where providers of this technology can generate the most revenue. These locations may not necessarily coincide with the optimum locations from a national perspective, which includes factors such as the development of a *network* of TSE facilities, locations that would have the *greatest potential* of reducing idling, and locations where the reduction in emissions would have the *greatest benefit*. The goal of this project was to develop and apply a methodology to identify optimum locations for deploying TSE sites across the nation.

The project team identified and prioritized a total of 15 major truck corridors along the interstate system of the United States using criteria such as corridor length, major activity centers, truck volume, truck growth rates, nonattainment areas, existing TSE sites, number of truck stops, average temperatures, and major intersections. Each corridor was divided into sections or zones of approximately 20 miles in length that were also prioritized using the same criteria. Based on zone rankings and spacing criteria, a set of primary and secondary zones were identified for installing TSE facilities along each corridor. After determining the zones for implementation, the TSE providers would then need to negotiate deals with the truck stops within those zones (only one truck stop per zone should be implemented). This research provides both an approach and optimum locations for implementing TSE sites across the nation.

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) through its SmartWay program has recently awarded $5 million in funding for anti-idling projects. According to EPA Administrator Stephen Johnson, “This is another step forward in our nation’s efforts to conserve fuel, achieve energy independence, and reduce emissions that contribute to soot and smog” (*1*). As part of this program, the Texas Transportation Institute (TTI) was awarded $3 million for a project that comprises both research and implementation of truck stop electrification (TSE). This paper documents the findings of the first phase of this project, which is to develop a national deployment strategy for TSE and to implement a number of TSE sites according to the newly developed strategy.

The economy of the United States is strongly reliant on heavy-duty diesel trucks to move a vast array of goods across the country. Currently there are more than 500,000 long-haul trucks operating in the United States (*2*). The U.S. Department of Transportation mandates that truck drivers rest 10 hours for every 14 hours of driving (*3*). This results in extended periods of time that drivers spend resting and sleeping in the cabs of their trucks. As a consequence, long-haul truck drivers idle their vehicles to operate heating systems and air conditioners, generate electricity, charge their vehicle’s batteries, and warm up the engines.

Although the EPA’s guidance defines long-duration idling as idling that occurs for a period of 15 minutes or longer, studies have found that truck drivers idle their engines from six to 10 hours per day while on the road (*4, 5*). A typical long-haul truck is on the road for an estimated 250 to 300 days per year, resulting in an average annual idling duration per truck of between 1,500 to 3,000 hours (*6, 7, 8*). At an idling emissions rate of approximately 135 grams of oxides of nitrogen (NOx) per hour, it is estimated that on a daily basis more than 500 tons of NOx is emitted. In addition to emissions, extended idling can also result in a considerable waste of fuel and can cause wear on the truck engines (more than 3,000 gallons of diesel is wasted on a daily basis nationwide). Studies have shown that a long-haul truck can idle away more than a gallon of diesel per hour (*9*).

Several methods have been developed to reduce extended truck idling. These methods can be divided into stationary and mobile technologies; the former refers to stationary equipment that can connect to the truck, and the latter refers to equipment onboard the truck, both reducing the need for extended idling. The focus of this research is on the implementation of stationary idle reduction technologies, specifically TSE sites currently produced by companies such as IdleAire Technologies Corporation and Shurepower.

In the case of IdleAire, the company would install an external heating, ventilation, and air conditioning (HVAC) unit at each truck parking space. HVAC is delivered to the truck by a microprocessor-controlled system that mounts in a window on either side of the truck. The unit contains temperature controls, credit card reader, display, and keypad. Temperature control is provided through an air conditioner duct. The unit also provides 110 volts of electric power for appliances inside the cab as well as television, local telephone, and Internet service. An additional 110-volt outlet mounted on the outside of the control console provides an external power hookup for engine block heating (*10, 11*).

With regard to Shurepower, the HVAC system is internal to the truck, and shorepower is used to power such units when the truck is parked. The Shurepower system gives access to 120-

or 240-volt electrical power from a land-based electrical power source. The Shurepower system has the option of including broadband Internet, cable television, and telephone.

Over the years these companies have implemented more than 30 TSE sites with hundreds more in the planning phase. These companies generally implement at locations where the installation can be subsidized by government agencies and where they can generate the most revenue. These locations may not necessarily coincide with the optimum locations from a national perspective—focusing on the greatest possible emissions reduction, nonattainment areas, and the creation of a national network of electrified truck stops.

The goal of this project is to develop and apply a methodology to identify optimum locations for deploying TSE sites across the nation. This paper explains the development of the evaluation criteria and decision-making methodology as well as the application of this methodology to 15 key truck corridors in the United States. The paper is divided into the following five sections—introduction, methodology, corridor selection, zone selection, and concluding remarks.

METHODOLOGY

Long-haul trucks perform the vast majority of their travel on the nation's interstate system, which is comprised of 62 main interstate routes and approximately 261 spur or radial interstate highways covering about 46,000 miles (*12, 13*). In developing a national TSE deployment strategy it was, therefore, decided to focus on the interstate system. This system was used to define 15 major truck corridors. The relative importance of these corridors (from the perspective of benefits accrued from implementing TSE facilities) was then determined. Each corridor was divided into sections or zones of approximately 20 miles in length and then prioritized (again from the perspective of benefits accrued from implementing TSE facilities). The final step was to use the zone rankings and other criteria to select first and second priority zones for implementation. These steps are illustrated in Figure 1, and the following sections describe the process in detail.

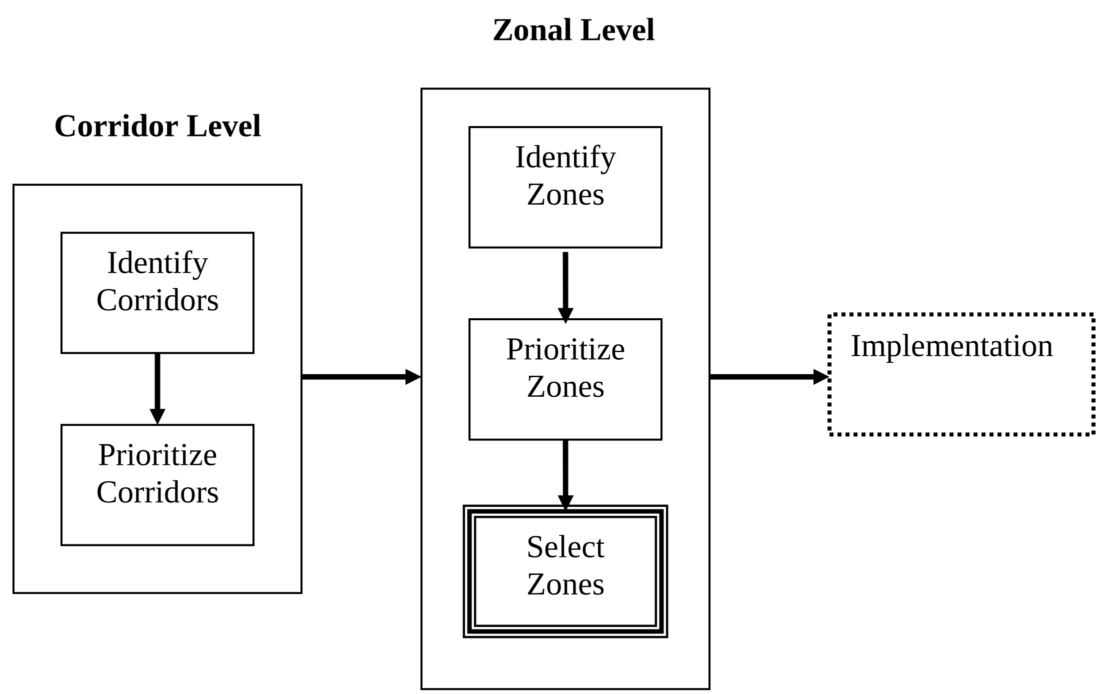

FIGURE 1 Graphical representation of TSE site selection process.

CORRIDOR SELECTION

Identification of Corridors

The study team used the Federal Highway Administration's Freight Analysis Framework (FAF) database to investigate possible national truck corridors (*14*). Truck volumes and patterns as well as major origins and destinations were considered in identifying the major truck corridors. Fifteen corridors were identified as major truck corridors in the United States. These corridors follow the interstate system, except in some major urbanized areas where they deviate from this system for short distances to track the major truck routes through these areas. Table 1 shows the major origins and destinations, freeways involved, and a description of the path from major city to major city. Figure 2 shows a map of these corridors. As shown in this figure, the majority of corridors are on the eastern side of the United States. This is indicative of the extensive trucking activity occurring on that side of the continent.

TABLE 1 Priority Truck Corridors

Number	Origin/Destination	Freeways	Path Description
Corridor A	New York–Minneapolis	I80–I90–I94	New York–Cleveland–Toledo–Chicago–Minneapolis
Corridor B	Boston–Birmingham	I95–I85–I20	Boston–New York–Philadelphia–Baltimore–Richmond–Atlanta–Birmingham
Corridor C	Chicago–Miami	I65–I24–I75–Florida Turnpike	Chicago–Nashville–Atlanta–Miami
Corridor D	Boston–Miami	I95	Boston–New York–Baltimore–Jacksonville–Miami
Corridor E	San Antonio–Jacksonville	I10	San Antonio–Houston–New Orleans–Jacksonville
Corridor F	Kansas City–New York	I70–I78	Kansas City–St. Louis–Indianapolis–Dayton–Harrisburg–New York
Corridor G	Detroit–Miami	I75	Detroit–Dayton–Knoxville–Atlanta–Miami
Corridor H	Laredo–Raleigh	I35–I30–I40	Laredo–Dallas–Memphis–Nashville–Knoxville–Raleigh
Corridor I	San Diego–Seattle	I5	San Diego–Los Angeles–Seattle
Corridor J	Los Angeles–Chicago	I15–I80–I55	Los Angeles–Salt Lake City–Des Moines–Chicago
Corridor K	Los Angeles–El Paso	I10	Los Angeles–El Paso
Corridor L	Chicago–Mobile	I65	Chicago–Indianapolis–Nashville–Birmingham–Mobile
Corridor M	Dallas–Raleigh	I20–I85	Dallas–Jackson–Birmingham–Atlanta–Raleigh
Corridor N	Knoxville–Harrisburg	I81	Knoxville–Harrisburg
Corridor O	New Orleans–Baltimore	I10–I65–I85–I95	New Orleans–Mobile–Atlanta–Richmond–Baltimore

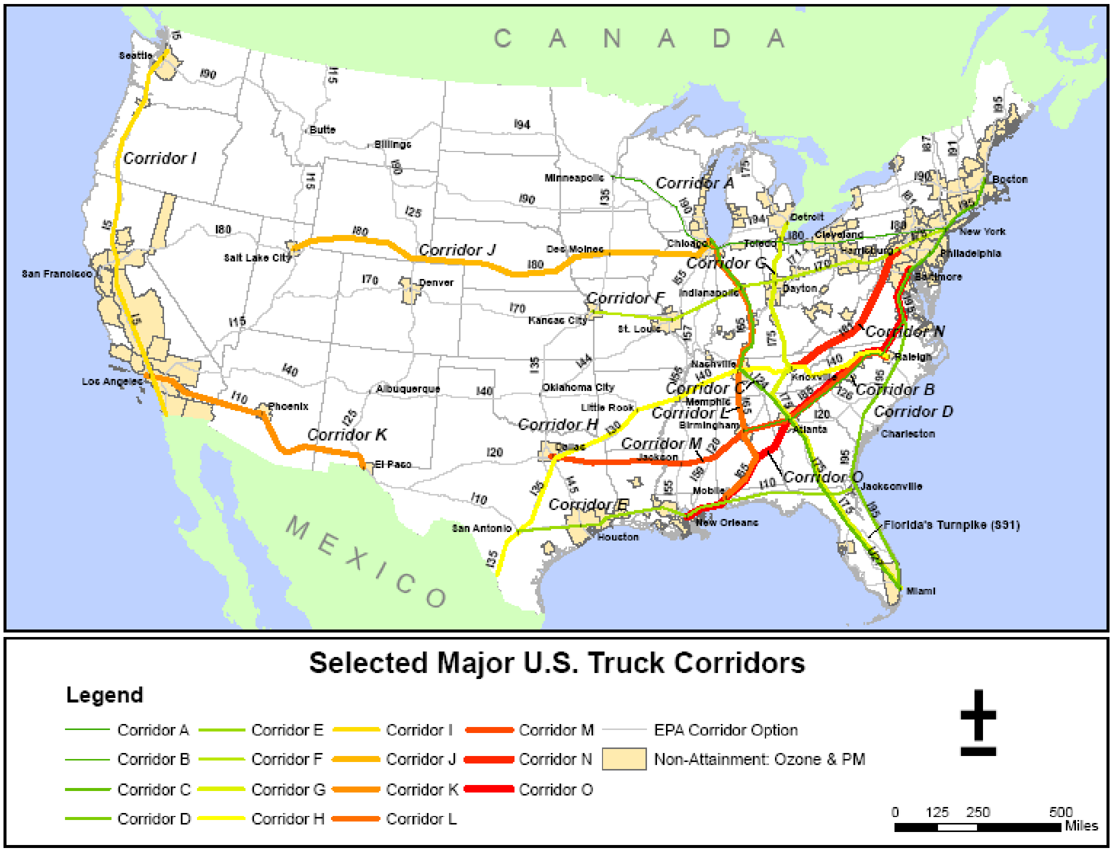

FIGURE 2 Major national truck corridors.

Prioritization of Corridors

As previously noted, the overall goal of implementing TSE facilities is to reduce idling, thereby reducing emissions and fuel consumption. Therefore, corridors were prioritized according to their ability to reduce these aspects through the implementation of TSE facilities. There were 25 criteria considered for prioritizing the national corridors. After deliberation it was decided that the nine criteria shown in Table 2 best address the overall goal. Table 2 also shows the data sources used for quantifying the various measures.

TABLE 2 Criteria for Prioritizing National Truck Corridors

Number	Measure	Description	Data Source
1	Corridor length	From origin to destination	Measurements using geographic information system (GIS) software using FAF database (*15*)
2	Major activity centers	Activity centers such as major urbanized areas and ports	Maps and local knowledge of the areas (*16*)
3	Average daily truck volume	Class 8 truck volume along corridor weighted by segment lengths	FAF database
4	Truck traffic growth rates	Estimated annual growth rate in truck volume	FAF database (1998 and 2010 volumes)
5	Nonattainment areas	Number of ozone and PM nonattainment areas	EPA website (*17*)
6	Existing TSE sites	Existing TSE sites as well as sites currently under construction	Provided by IdleAire and Shurepower
7	Number of truck stops	Number of truck stops that have 75 or more truck parking spaces	Provided by IdleAire and other sources
8	Percentage of corridor experiencing hot and cold days	Percentage of corridor with average maximum temperatures above 90°F or average minimum temperatures below 40°F during two hottest and coldest months of 2005	From Spatial Climate Analysis Service (*18*)
9	Number of major interchanges	Number of freeway to freeway interchanges with more than 2,000 trucks per day on crossing freeway	FAF database

After the data were collected for all 15 corridors, a multi-criteria decision-making method was used to rank the corridors in terms of their importance for implementing truck stop electrification. There are many multi-criteria decision-making techniques available. Decision makers often use Multi Attribute Utility Theory (MAUT) as a technique for evaluating projects, programs, and policies with multiple and often conflicting goals. The MAUT technique is popular because it is a relatively intuitive process and fairly easy to implement. It was, therefore, decided to use this methodology in ranking the corridors. The following equation shows the formulation for the MAUT method (*19*):

$$U_j = \sum_{k=1}^{n_k} w_k n_{kj} \qquad (1)$$

Where:

U_j = utility of alternative j,

w_k = weight of the k^{th} criterion, and

n_{kj} = normalized criterion k value for alternative j.

Linear normalization was used to provide a scaling for the utility values from zero to one, with zero being the worst possible score and one being the best possible score. A more detailed description of normalization and the application of the MAUT method can be found elsewhere

(*20*). Sensitivity analyses were performed using various combinations of criteria weights. It was found that the utility values show very small variability based on weights. Using weights can also be a highly controversial issue, with subjectivity and differing opinions playing a major role. Based on this and the limited differences that the weighting had, it was decided to consider equal weights for all the criteria. Table 3 shows the quantified criteria values for the 15 selected corridors, and Table 4 shows the ranking of the 15 corridors.

TABLE 3 Criteria Values for Selected Corridors

Corridor	Length (Miles)	Major Activity Centers	Average Daily Truck Volume	Annual Truck Growth Rate	Non-attain-ment Areas	Existing TSE Sites	Number of Truck Stops	% Above 90°F or below 40°F	Major Inter-changes
A	1231	14	8586	1.79%	11	1	65	50%	18
B	1271	21	5039	–0.87%	14	5	60	51%	18
C	1220	19	6435	2.13%	7	1	65	56%	11
D	1532	20	3224	1.07%	14	3	61	55%	15
E	1074	14	6202	2.48%	8	4	52	55%	7
F	1224	12	5572	1.51%	13	2	65	50%	19
G	1226	18	5745	2.53%	9	3	62	56%	14
H	1635	19	5503	3.04%	6	5	72	62%	14
I	1262	17	6106	2.60%	7	2	27	61%	13
J	1412	8	7654	3.20%	2	0	53	50%	8
K	803	10	5752	3.21%	4	2	30	77%	6
L	920	11	5386	1.83%	6	0	46	67%	8
M	1190	18	5003	1.70%	7	4	65	77%	11
N	542	9	4558	4.28%	2	1	32	50%	6
O	1161	20	6005	0.27%	9	3	48	57%	13

TABLE 4 Ranking of Selected Corridors

Ranking	Corridor	Origin/Destination	Utility Value
1	A	New York–Minneapolis	0.67
2	H	Laredo–Raleigh	0.62
3	C	Chicago–Miami	0.60
4	D	Boston–Miami	0.60
5	F	Kansas City–New York	0.59
6	G	Detroit–Miami	0.58
7	M	Dallas–Raleigh	0.57
8	B	Boston–Birmingham	0.54
9	I	San Diego–Seattle	0.51
10	O	New Orleans–Baltimore	0.51
11	J	Salt Lake–Chicago	0.46
12	L	Chicago–Mobile	0.45
13	E	San Antonio–Jacksonville	0.41
14	K	Los Angeles–El Paso	0.39
15	N	Knoxville–Harrisburg	0.25

Table 4 shows that Corridor A is clearly the highest ranking corridor for implementing TSE facilities. The utility values of the following six corridors—H, C, D, F, G, and M—vary by only five points, making them all good candidates for implementation. The utility values of the remaining eight corridors show a steady decline to Corridor N, which received the lowest rating.

ZONE SELECTION

Identification of Zones

Each corridor was divided into zones or sectors of approximately 20 miles in length and 3.75 miles in width (1.875 miles on either side of the major freeway). The zones were identified so that they fully included major interchanges and truck stops. Typically more than 50 zones were selected per corridor. The 3.75-mile buffer area along the freeway corridors was used to identify all the truck stops with 75 or more parking spaces that are associated with the zones. Within this buffer area the truck drivers will be prepared to divert from the interchange and visit a truck stop. The buffer area was selected so that truck stops could be captured where truck drivers could make a small detour from the interstate system to get to them. The reason why 75 spaces were selected is because the experience of companies providing idle reduction technologies has shown that truck stops with 75 or more parking spaces are the best candidates for TSE applications.

Prioritization of Zones

Only zones with at least one truck stop with more than 75 spaces were considered for prioritization and, therefore, selection. As in the case with the corridors, the zones were prioritized based on their ability to accommodate TSE facilities that could reduce idling and thereby reduce emissions and fuel consumption. The same criteria as listed in Table 2 (with the exception of length and a slight modification of temperature) were used for prioritizing the zones. Corridor length was obviously not applicable as a criterion for selecting zones, and in the case of temperature, the average maximum temperature during July and August and the average minimum temperatures during January and February were used instead of the percentage of corridor experiencing hot and cold days. Data were collected for each zone using the same sources as listed in Table 2. The MAUT approach as shown in Equation 1 was again applied corridor by corridor to rank the zones within each corridor. As in the case of the corridors, it was decided not to use weights.

Selection of Zones

As previously indicated, the following three elements need to be addressed to produce an implementation plan that would have the optimum benefit in terms of reducing emissions and fuel consumption:

- Develop a *network* of TSE facilities that would provide more than 500,000 long-haul trucks adequate opportunity to hook up to stationary idle reduction technologies during their trips.
- Select locations that would have the *greatest potential* of reducing idling and, therefore, emissions and fuel consumption.
- Select locations where the reduction in emissions and fuel consumption would have the *greatest benefit*.

The study team had conversations with truck drivers as well as other individuals involved in the trucking industry to determine the spacing between TSE sites that would provide the best network effect. It was decided that a primary network of TSE sites spaced at approximately 200 to 300 miles would provide the bare minimum to truck drivers. A secondary network that would be implemented after the primary network is in place would result in a spacing of between 100 and 150 miles between TSE facilities. In urbanized areas with higher levels of congestion and, therefore, longer travel times, shorter spacing between TSE facilities would be required.

The ranking exercise produced priority lists of the zones that are available for implementation in each corridor. The following are factors considered in selecting the optimum locations for TSE implementation:

- The zone rankings served as a guideline for selecting the primary and secondary priority zones for implementation.
- In selecting the primary and secondary zones, each corridor was considered individually.
- The spacing between primary zones is approximately 200 to 300 miles.
- The spacing between zones once the secondary zones were included is approximately 100 to 150 miles.
- The primary zones were selected first, and the secondary zones were identified between the primary zones to create optimum spacing.
- In cases where equally good zones are located adjacent to each other, both zones were typically selected and combined to provide more options for implementation.

- Local knowledge of the area was used to supplement information on the zone rankings.
- In the case of urbanized areas that contain more than one of the selected corridors, the study team used detailed maps and local knowledge to define the routes and to make the zone selections.
- In areas where corridors overlap, only one unique set of zones was selected representing both corridors in that area.
- All the primary zones on a specific corridor need to be implemented first before any of the secondary zones are implemented.

Table 5 shows the number of existing TSE sites, number of primary and secondary zones selected, and number of truck stops with 75 or more spaces in the primary and secondary zones for each corridor. The table shows that, on average, each corridor has 2.4 TSE sites, and an average of four primary and secondary zones were selected per corridor. A total of more than 100 zones containing more than 300 large truck stops were selected. It should be noted that it is possible to implement more than one TSE site per zone. The number of electrified parking spaces that can be implemented in a zone is determined by the demand for such spaces, which is related to factors such as truck volume, average temperature, proximity of activity centers, number of large truck stops, etc. Development of such a demand model is beyond the scope of this paper.

TABLE 5 Number of Zones Selected for Primary and Secondary Implementation

Corridor	**Origin/Destination**	**Existing TSE Sites**	**Primary Zones Selected**	**Truck Stops in Primary Zones**	**Secondary Zones Selected**	**Truck Stops in Secondary Zones**
A	New York–Minneapolis	1	5	29	6	15
B	Boston–Birmingham	1	2	3	3	10
C	Chicago–Miami	3	5	15	5	15
D	Boston–Miami	4	5	17	6	12
E	San Antonio–Jacksonville	0	4	8	4	9
F	Kansas City–New York	5	5	18	5	16
G	Detroit–Miami	3	4	9	6	19
H	Laredo–Raleigh	5	2	3	5	11
I	San Diego–Seattle	0	6	8	2	2
J	Salt Lake–Chicago	2	7	17	3	8
K	Los Angeles–El Paso	1	2	5	2	4
L	Chicago–Mobile	4	5	14	2	7
M	Dallas–Raleigh	2	3	9	3	8
N	Knoxville–Harrisburg	3	1	2	2	7
O	New Orleans–Baltimore	2	2	4	4	13
Average		**2.4**	**3.9**	**10.7**	**3.9**	**10.4**

A map showing the locations of the selected zones and tables containing associated information were prepared for each corridor. For example, Figure 3 contains a map showing the locations of the primary and secondary zones along Corridor A. The figure shows that five primary zones and six secondary zones were selected and no existing TSE facilities exist along this corridor.

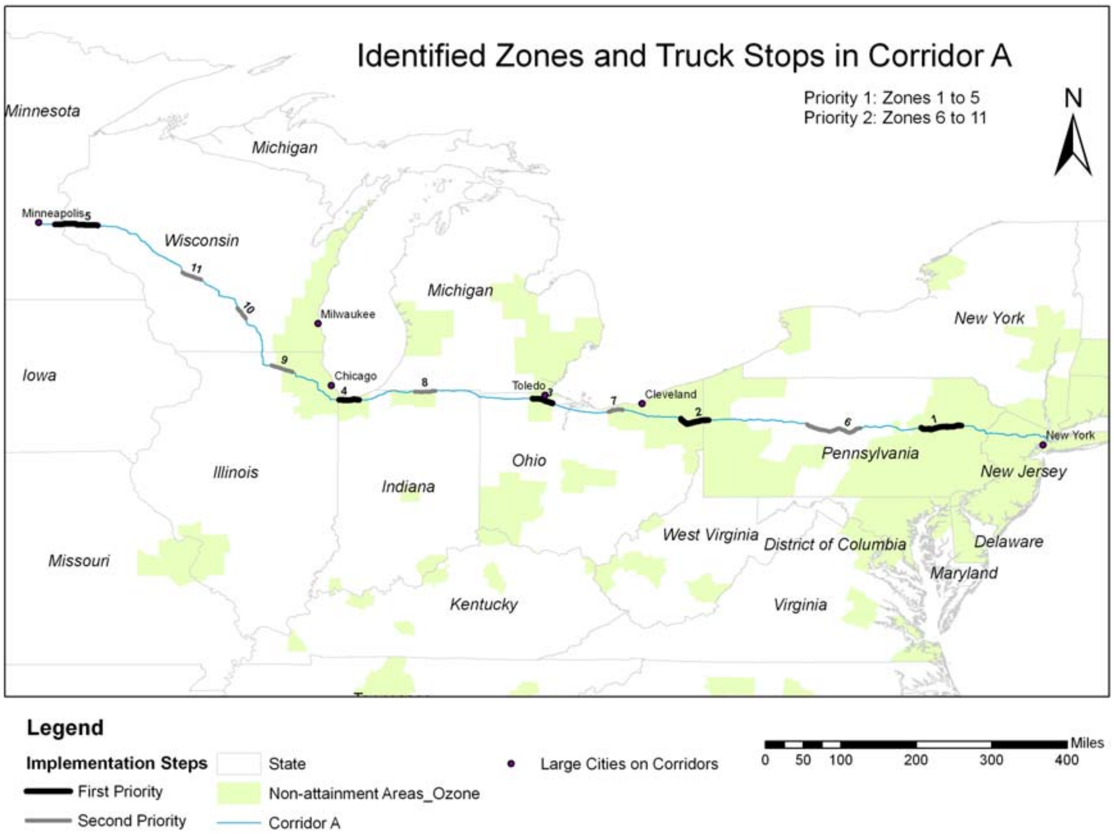

FIGURE 3 Primary and secondary zones along Corridor A.

Table 6 contains a description of the selected zones along Corridor A—zone length, towns at the ends of the zones, and coordinates defining the zones. Table 7 contains information on truck stops with more than 75 spaces located in the selected zones along Corridor A—truck stop name, number of spaces, address, and highway location.

TABLE 6 Description of Identified Zones along Corridor A

Corridor A							
Priority	**Zones**	**Highway**	**Length (Miles)**	**Description (West–East)**		**Coordinates (Longitude and Latitude)**	
				From	**To**	**Beginning**	**End**
1	1	I-80	43.66	Blakeslee, PA	Mifflinville, PA	–75.5718, 41.0755	–76.346, 41.0369
	2	I-80	32.72	West Middlesex, PA	Newton Falls, OH	–80.4214, 41.1808	–80.9496, 41.2098
	3	I-80/90	21.29	Genoa, OH	Swanton, OH	–83.4128, 41.5091	–83.7982, 41.5991
	4	I-80/94	20.41	Crocker, IN	Munster, IN	–87.1245, 41.5733	–87.505, 41.5741
	5	I-94	40.95	Wilson, WI	Saint Paul, MN	–92.1382, 44.9305	–92.9534, 44.9474
2	6	I-80	62.62	Tylersville, PA	Plymptonville, PA	–77.5109, 41.0327	–78.5321, 41.1029
	7	I-80/90	15.51	Elyria, OH	South Amherst, OH	–82.066, 41.381	–82.3453, 41.3441
	8	I-80/90	20.68	Bristol, IN	Granger, IN	–85.6592, 41.7508	–86.0497, 41.7309
	9	I-90	22.88	Gilberts, IL	Belvidere, IL	–88.3942, 42.105	–88.8052, 42.2315
	10	I-90/94	16.68	Maple Bluff, WI	Lodi, WI	–89.295, 43.1338	–89.4558, 43.3415
	11	I-94	20.67	New Lisbon, WI	Tomah, WI	–90.1511, 43.8847	–90.5106, 44.024

Table 6 provides a more detailed description of the identified zones along Corridor A. The table indicates the zone number, highway(s) that designate the corridor within the zone, zone length, start and end town or city (these are provided in an east to west direction and identify the closest town or city to the beginning and end of the zone), and longitude and latitude of the beginning and ending of the zone.

Table 7 provides information on the truck stops with more than 75 parking spaces located within the first priority zones along Corridor A. The table shows the zone number, truck stop name, number of spaces, address, and directions.

TABLE 7 Description of Identified Large Truck Stops along Corridor A

Corridor A				
Zone	**Travel Center**	**# Spaces**	**Address**	**Directions**
1	Hickory Run Truck Plaza	75	I-80 Exit 41 NW, White Haven, PA	I-80 Exit 274 (PA 534)
	Bandit Truck Stop #2	80	I-80 Exit 41 (Route 534), White Haven, PA 18661	I-80 Exit 41 (PA 534)
	Brennan's Auto/Truck Plaza	75	I-80 Exit 37, Mifflinville, PA 18631	I-80 Exit 37 (PA 339)
2	Truck World	150	6965 Truck World Boulevard, Hubbard, OH 44425	I-80 Exit 234 (OH 7 & US 62)
	TA #058–Youngstown	150	5400 76th Drive, Youngstown, OH 44515	I-80 Exit 223 A (OH 46 S)
	Short Stop Truck Plaza	120	6152 W Market Street, Leavittsburg, OH 44430	I-80 Exit 14
	Speedway #8242–Youngstown	300	871 N Canfield-Niles Road, Youngstown, OH 44515	I-80 Exit 223 A (OH 46 N)
	ALRI Truck & Auto Plaza	75	4322 State Highway 5, Newton Falls, OH 44444	I-80 (OHTP) Exit 209 (OH 5 W)
	Pilot #281–Girard	75	2786 Salt Springs Road, Girard, OH 44420	I-80 Exit 226 (Salt Spring Road)
	Petro #20–Girard	322	1 Petro Place, Girard, OH 44420	I-80 Exit 226 (Salt Spring Road)
	Mr. Fuel #5–Girard	100	2840 Salt Springs Road, Girard, OH 44420	I-80 Exit 226 (Salt Spring Road)
	Pilot #003–Austintown	193	1150 North Canfield-Niles Road, Austintown, OH 44515	I-80 Exit 223 B (US 46 N)
	Flying J–Hubbard	150	2226 N Main, Niles, OH 44446	I-80 Exit 234 B (Highway 62)
3	Stony Ridge Travel Center	200	3491 Latcha Road, Millbury, OH 43447	I-280 Exit 1 B (1 mile N of OHTP Exit)
	TA #087–Toledo	179	3483 Libby Road, Perrysburg, OH 43551	I-80 Exit 71 (Libby Road)
	Fuel Mart #641–Perrysburg	200	3654 Libby Road, Perrysburg, OH 43551	I-80-90 Exit 71 (OH 420 S)
	Petro #17–Stony Ridge	318	26398 Baker Drive, Perrysburg, OH 43551	I-280 Exit 1 B (1 mile N of OHTP Exit)
	Flying J–Perrysburg	150	26415 Warns Road, Perrysburg, OH 43551	I-280 Exit 1 B (1 mile N of OHTP Exit)

TABLE 7 Description of Identified Large Truck Stops along Corridor A (Continued).

Corridor A				
Zone	**Travel Center**	**# Spaces**	**Address**	**Directions**
4	Pilot #271–Gary	122	2501 Burr Street, Gary, IN 46406	I-80-94 Exit 6 (Burr Street)
	Crazy D’s Truck Stop	100	8121 Melton Road, Gary, IN 46403	US 20 & IN 51
	TA #010–Gary	234	2510 Burr Street, Griffith, IN 46319	I-80-94 Exit 6 (Burr Street)
	Flying J–Lake Station	350	1401 Ripley Street, Lake Station, IN 46405	I-80-94 Exit 15 B (IN 51–Ripley)
	Toll Road BP #70512	200	5105 Plaza Drive (1 South), Portage, IN 46368	I-80-90 MM 22 EB
	Steel City Truck Plaza	344	3001 Grant Street, Gary, IN 46408	I-80-94 Exit 9 A (Grant Street S)
	TA #219–Lake Station	243	1201 N Ripley Street, Lake Station, IN 46403	I-80-94 Exit 15 B (IN 51–Ripley)
	Flying J–Gary	165	3150 Grant Street, Gary, IN 46408	I-80-94 Exit 9 A (Grant Street S)
5	TA #192–Hudson	90	713 Highway 12, Hudson, WI 54016	I-94 Exit 4 (US 12)
	Ray’s Super Stop	100	501 US Highway 63, Baldwin, WI 54002	I-94 Exit 19 (US 63)
	Kwik Trip #603–Wilson	125	Highway 94 & 128, Wilson, WI 54027	I-94 Exit 28 (WI 128)

Similar maps and tables have been produced for each of the 15 corridors and are currently being developed into an Internet tool that will be accessible to the general public and would be useful to states, metropolitan planning organizations, cities, TSE providers, truck stop owners, etc.

CONCLUDING REMARKS

Locations for truck stop electrification have previously been determined by economic factors—where government agencies can subsidize the installations and where providers of this technology can generate the most revenue. These locations may not necessarily coincide with the optimum locations from a national perspective. This perspective would involve the following:

- Develop a *network* of TSE facilities that would provide the long-haul trucks adequate opportunity to connect to stationary idle reduction technologies during their trips.
- Select locations that would have the *greatest potential* of reducing idling and, therefore, emissions and fuel consumption.

- Select locations where the reduction in emissions and fuel consumption would have the *greatest benefit*.

The goal of this project was to develop and apply a methodology to identify optimum locations for deploying TSE sites across the nation.

Using truck volumes, growth rates, and local knowledge, the study team identified 15 major truck corridors along the interstate system of the United States. These corridors were prioritized using the following nine criteria: corridor length, major activity centers, truck volume, truck growth rates, nonattainment areas, existing TSE sites, number of truck stops (75 or more spaces), average temperatures, and major intersections. A multi-criteria decision-making methodology was used to prioritize these corridors. It was found that the corridor stretching from New York to Minneapolis ranked the highest.

A network of primary and secondary zones was developed for the 15 major corridors. After determining which zones should be implemented, it would be up to the TSE providers to negotiate contracts with the truck stops within those zones. Depending on the demand, it is possible to implement more than one truck stop per zone.

This research provides both an approach and recommended locations for implementing TSE sites across the nation. The product is currently being developed into a user-friendly Internet tool to be used by public- and private-sector entities interested in implementing TSE facilities.

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