Case Study

Arizona Interstate 10 Alternative Fuels Corridor Deployment Plan for Electric Vehicle Charging and Compressed Natural Gas Fueling

APPLIED RESEARCH PROJECT

Pima Association of Governments (PAG), located in Pima County, Arizona, was awarded a grant from the Federal Highway Administration (FHWA) and partnered with the Arizona Department of Transportation (ADOT) and Valley of the Sun Clean Cities Coalition (VSCCC) to develop a plan to deploy electric vehicle (EV) fast charging and compressed natural gas (CNG) fueling facilities at strategic locations along Interstate 10 (I-10). These new facilities will enable passenger and commercial vehicles to cross Arizona, between the borders with California and New Mexico, using electricity and natural gas alternative fuels. FHWA developed the Alternative Fuels Corridor (AFC) Program, as required by the Fixing America's Surface Transportation (FAST) Act, to designate national EV charging, hydrogen, propane, and natural gas fueling along National Highway System (NHS) corridors.

The FHWA assigns nominated NHS segments into one of the following AFC designations:

- Corridor Ready - A sufficient number of facilities exist on the corridor to allow for corridor travel using one or more alternative fuels.
- Corridor Pending - An insufficient number of facilities currently exist on the corridor to allow for corridor travel using one or more alternative fuels.

The FHWA AFC program requires no greater than 50 miles between EV Direct Current Fast Charge (DCFC) charging stations and 150 miles between CNG fueling facilities, and a maximum distance of five miles from I-10 to obtain Corridor Ready designation.

FOCUS LOCATIONS

Transitioning the Corridor Pending segments of I-10 in Arizona to Corridor Ready will require the addition of four DCFC EV charging stations and one CNG fueling station at the locations identified in Table 1 (below):

- Two additional DCFC EV charging stations are required between Phoenix and California
- Two additional DCFC EV charging stations are required between Tucson and New Mexico
- One additional CNG fast-fill fueling station is required between Tucson and New Mexico

Table 1- Potential EV Charging Station and CNG Fueling Facilities

Site	Location	I-10 Exit #	Type
Pilot #1212	Salome, AZ	45	EV
Pilot #1215	Salome, AZ	45	EV
Pilot #1180	Tonopah, AZ	94	EV
TravelCenters of America #226	Willcox, AZ	340	EV / CNG
Willcox Truck Plaza	Willcox, AZ	340	EV / CNG
Pilot #1269	San Simon, AZ	378	EV / CNG
4K Truck Stop	San Simon, AZ	378	EV / CNG

Pima Association of Governments

PROJECT GOAL AND APPROACH

The goal of this project was to develop a corridor deployment plan to facilitate installation of EV charging and CNG fueling facilities with the support of public-private partnerships. The locations of focus were identified, and steps were taken to achieve this goal and transition the Corridor Pending segments of I-10 to Corridor Ready status:

- Identify and verify existing EV charging stations and CNG fueling sites located along the EV Charging and CNG Corridor Pending segments of I-10 that meet current FHWA criteria.
- Identify and evaluate gaps greater than 50 miles for EV charging and 150 miles for CNG fueling, using ArcGIS web maps and publicly available mapping products to determine the minimum number of new facility locations required to close those gaps.
- Select areas where additional facilities are required to fill the distance gaps and identify potential locations along those highway exits, using ArcGIS web map data layers along with mapping resource tools such as Google Earth, Bing and Pictometry to determine site suitability selection for installation of infrastructure. Further evaluate potential facility locations by conducting field site visits using Environmental Systems Research Institute's (Esri's) Survey123 application.
- Gather contact information for the prospective facility owners/operators, utilities and other stakeholders.
- Form a public-private collaborative advisory group, invite stakeholders and set quarterly meetings to gather input.
- Develop a plan using stakeholder advisory group input and partner resources.

ARIZONA INTERSTATE/INFRASTRUCTURE COLLABORATIVE (AIIC) – PUBLIC/PRIVATE PARTNERSHIP

The AIIC was formed as an integral part of developing a plan for deployment of EV charging and CNG fueling facilities along I-10. Key stakeholders in this process were the truck stop travel center potential site hosts, due to their 24-hours-a-day/365- days-per-year operation, adequate space and parking for alternative fuel facilities, and amenities such as lighting, restrooms, and food and beverages. Additional invited stakeholders included electric and natural gas utilities, EV charging and CNG fueling companies, project partners, various public entities and public interest groups. Partners gathered and provided data for cost estimates, rate plans, funding options, signage, traffic counts, EV, CNG and conventional vehicle statistics, demographics and other items for the plan.

TOOLS DEVELOPED

Two tools were developed with a goal of broader adoption. These tools were built within the Esri suite of services leveraging existing open data sources and analytical resources made available through National Renewable Energy Laboratory (NREL) application programming interface (API).

SURVEY 123 APPLICATION – POTENTIAL ALTERNATIVE FUEL SITE SURVEY TOOL

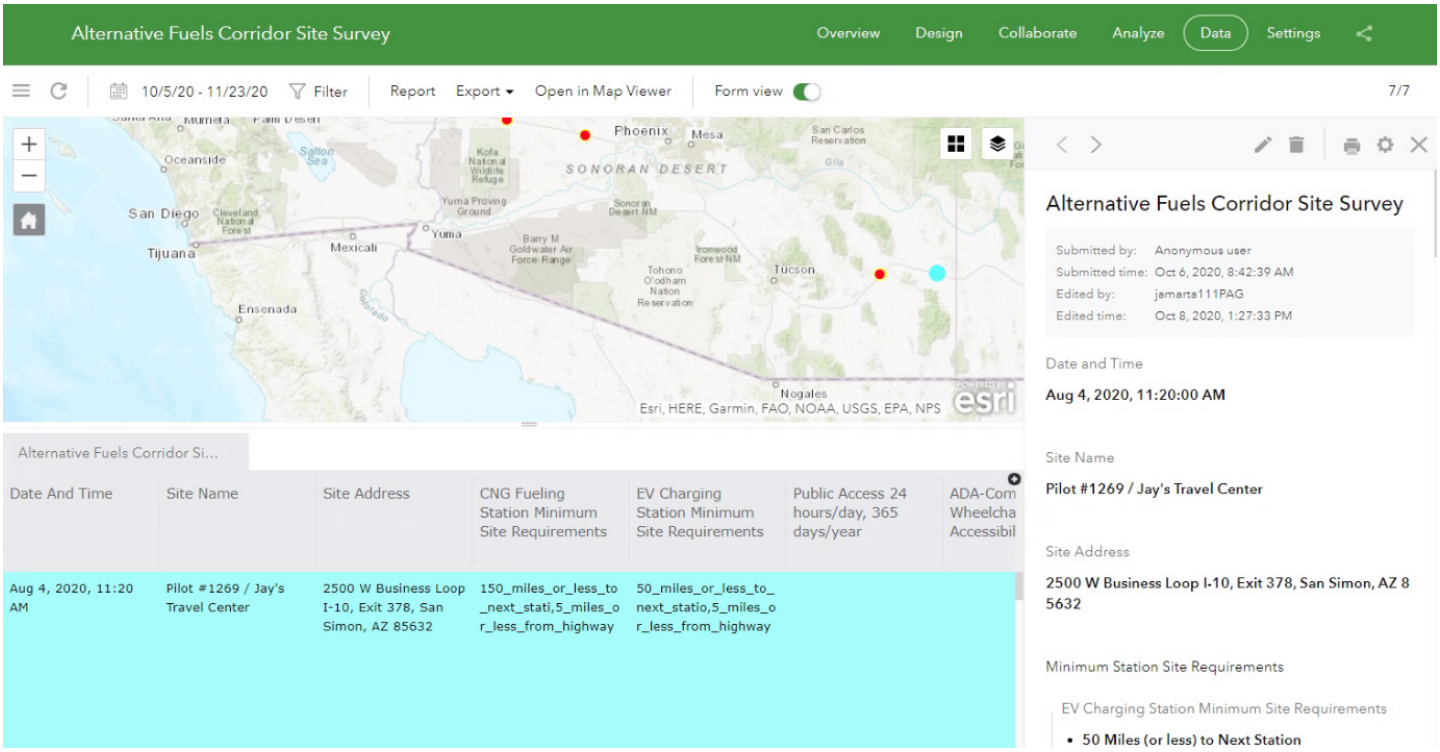
The first tool integrates the siting requirements into an Esri ArcGIS Survey123 form to facilitate data collection and reporting. The Esri ArcGIS Survey123 application was selected because Esri products are the industry standard. It is an easy-to-use form-centric data collection application, and any organization with ArcGIS Enterprise has free access. To collect and report site data, an Esri Survey123 form was developed. Once collected, data are published to ArcGIS and then available on ArcGIS Online (AGO) or through an organization's Esri Portal account.

The process of collecting data in the field for each site is straight forward. The Survey123 form is completed and the data are available for subsequent editing, analysis and reporting using Esri's AGO or the subscribing organization's portal. Data can be collected using the form on a phone, tablet or with a web browser.

Once in the field, the custom form in the Survey123 application can be completed. In addition to collecting the required site details, additional data about the collection process is also gathered. The form includes fields for site name and address, the standards and amenities available, as well as photos, and the latitude and longitude (XY) of the site. Additional fields include date and time of the collection as well as data collector name, email address and signature.

With an Esri login to ArcGIS Online or your Portal, once data are input, they are available to view, analyze, edit and map (Figure 1).

Figure 1 - Survey 123 Potential Site Survey Application Tool



POTENTIAL STATION ROUTE DISTANCE TOOL

The second tool is an enhancement to the station route distance tool to support route distance analysis of potential sites using U.S. Department of Energy (USDOE) web services. For this exercise, we added additional datasets and tools to the EV Charging and CNG Potential Corridor interactive web maps. USDOE provided these resources in a very consumable set of AGO web maps that PAG staff saved to its AGO organizational account. These source web maps were then customized with additional data that were pulled in from open source map service layers to add additional content to support this effort (Figure 2).

Key information resources supporting this exercise include USDOE AFC AGO Web Maps, Homeland Infrastructure Foundational Level Data (HIFLD) open map services, custom built map services of project partner sites, and La Paz and Cochise counties' open data parcel map services. This exercise focused on readily available national open data resources and demonstrated the application of leveraging local open data sources to facilitate broader adoption of this methodology in other locales.

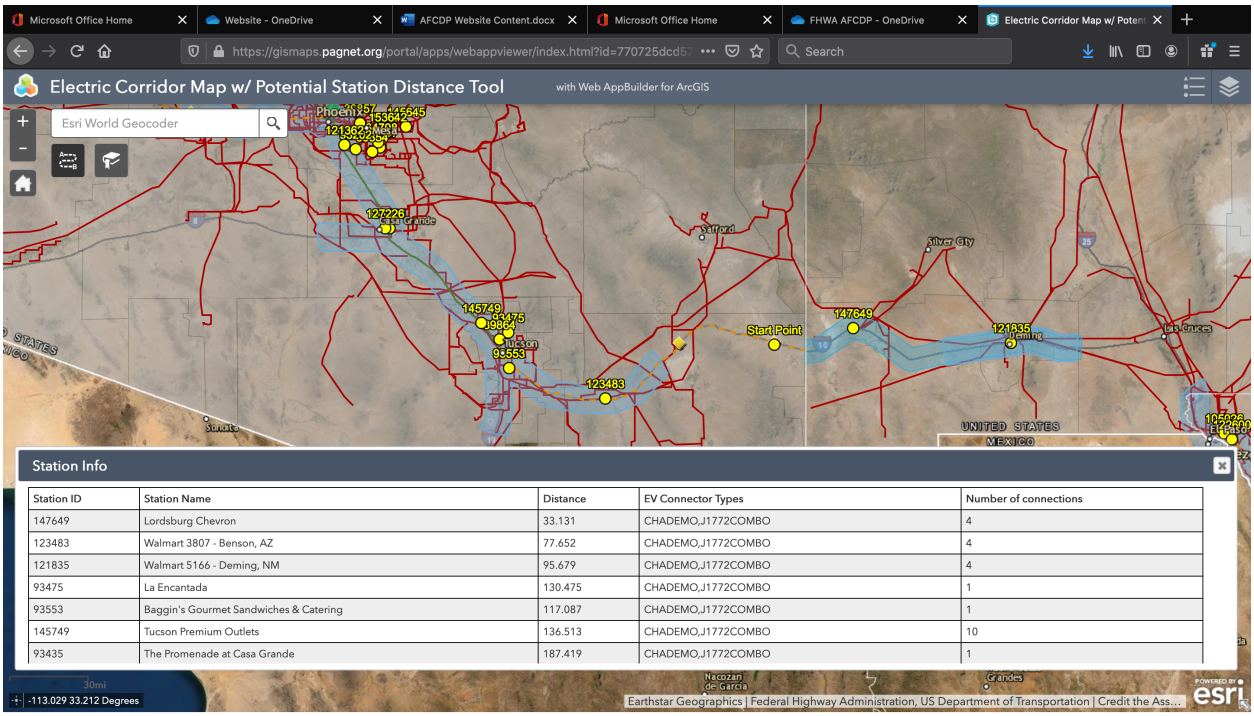
The Potential Station Route Distance tool was developed leveraging the NREL Developer Tools by combining the functionality of the nearest station query and the drive distance request. It is an enhancement to the currently published Station Distance Tool as it better supports the selection of potential station sites. The current tool calculates the distance between existing stations. This enhanced tool allows the user to consume NREL data sources and analysis in the process of displaying drive distance from any potential location to NREL published station location data.

Beta functionality of this tool was built in an internal custom web map interface. It has been migrated to be deployed as an AGO Widget that can be added to an Esri Web App Builder interface that consumes the NREL published corridor web maps referenced above.

The user is asked to select a fuel type (EV or CNG), clicks a point on the map and is returned to a table of the 20 nearest stations within 200 miles. The tool executes two API calls and passes in a query string to gather the nearest relevant EV or CNG sites for this exercise. While the initial call retrieves the data and populates a table of the 20 nearest EV or CNG sites within 200 miles radius, the second API request evaluates the route distance from the user-generated point on the map to each EV or CNG site in the list and sorts the table based on route distance.

The user can then explore the nearest stations by clicking on the station row in the table to see the related route displayed on the map. This approach provides flexibility for the user to identify the relevant nearest station locations and distance either east/west or north/south along a corridor.

Figure 2 - Charging Corridor with Potential Station Distance Tool



Station ID	Station Name	Distance	EV Connector Types	Number of connections
147649	Lordsburg Chevron	33.131	CHADEMO,J1772COMBO	4
123483	Walmart 3807 - Benson, AZ	77.652	CHADEMO,J1772COMBO	4
121835	Walmart 5166 - Deming, NM	95.679	CHADEMO,J1772COMBO	4
93475	La Encantada	130.475	CHADEMO,J1772COMBO	1
93553	Baggin's Gourmet Sandwiches & Catering	117.087	CHADEMO,J1772COMBO	1
145749	Tucson Premium Outlets	136.513	CHADEMO,J1772COMBO	10
93435	The Promenade at Casa Grande	187.419	CHADEMO,J1772COMBO	1

SIGNAGE

The FHWA developed signage for AFCs in compliance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). MUTCD provisions currently allow the use of General Service signs along AFCs, but not the use of Specific Service signs for NHS AFCs.

ADOT prefers the use of Specific Service signs along AFCs in Arizona through the Grand Canyon State Logo Sign Program. Future changes to the MUTCD may allow for Specific Service Alternative Fuels signage and provide alternative fuel businesses the opportunity to participate in the logo sign program.

FUNDING SOURCES AND COST ESTIMATES

AIIC partners identified funding assistance through the CMAQ program, utility tariffs and rebate programs, automobile manufacturer and Electrify America Cycle 3 investments, the National Highway Charging Collaborative, and alternative fuels infrastructure grants that may come available following passage of future congressionally approved transportation bills.

EV charging and CNG fueling infrastructure cost estimates were compiled through AIIC partner input: International Council on Clean Transportation (ICCT) Estimating electric vehicle charging infrastructure costs across major U.S. metropolitan areas and US DOT Office of Energy Efficiency & Renewable Energy (EERE) Clean Cities Costs Associated With Compressed Natural Gas Vehicle Fueling Infrastructure (Tables 2 and 3). Maintenance was not exclusively included in cost estimates due to variability of owner/operator scenarios.

Table 2 - DCFC Charging Station Cost Estimates

Location	2 Chargers 1 50 kW CHAdeMO 1 150 kW CCS	4 Chargers 1 50 kW CHAdeMO 3 150 kW CCS	8 Chargers 1 50 kW CHAdeMO 6 150 kW CCS 1 350 kW CCS
Salome	$175,443	$349,361	$751,816
Tonopah	$188,443	$366,361	$781,816
Willcox	$162,543	$328,461	$716,016
San Simon	$162,543	$328,461	$716,016

Table 3 - CNG Compressor Station Cost Estimates

Location	Medium Station 500-800 gge/day	Large Station 850-2,000 gge/day
Willcox / San Simon	$700,000-900,000	$1,200,000-2,000,000

Resources

PAG Arizona I-10 Alternative Fuels Corridor Deployment Plan https://pagregion.com/sustainability/air-quality/i10-alt-fuels-deployment-plan/
FHWA Alternative Fuel Corridors Program https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/