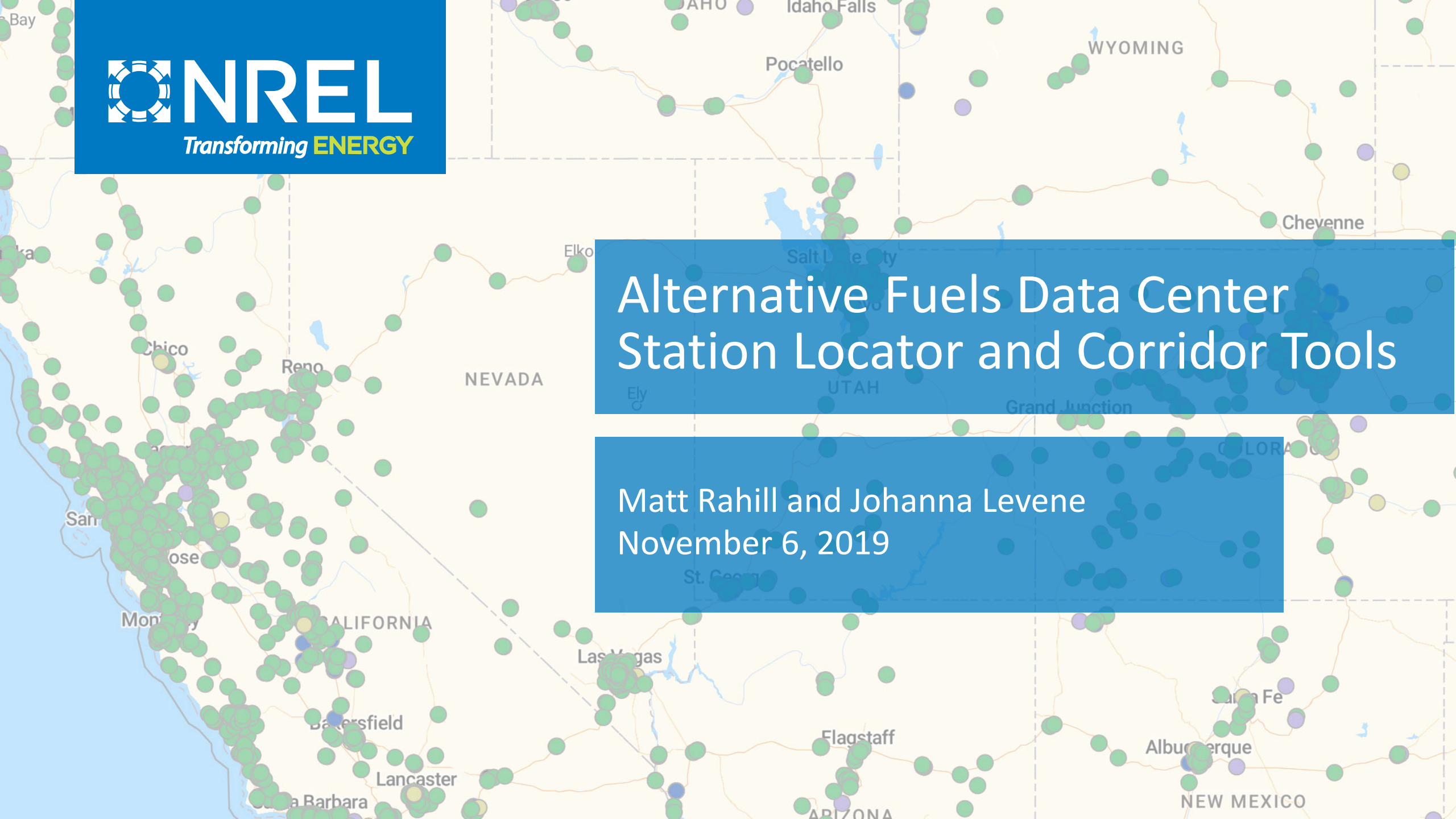


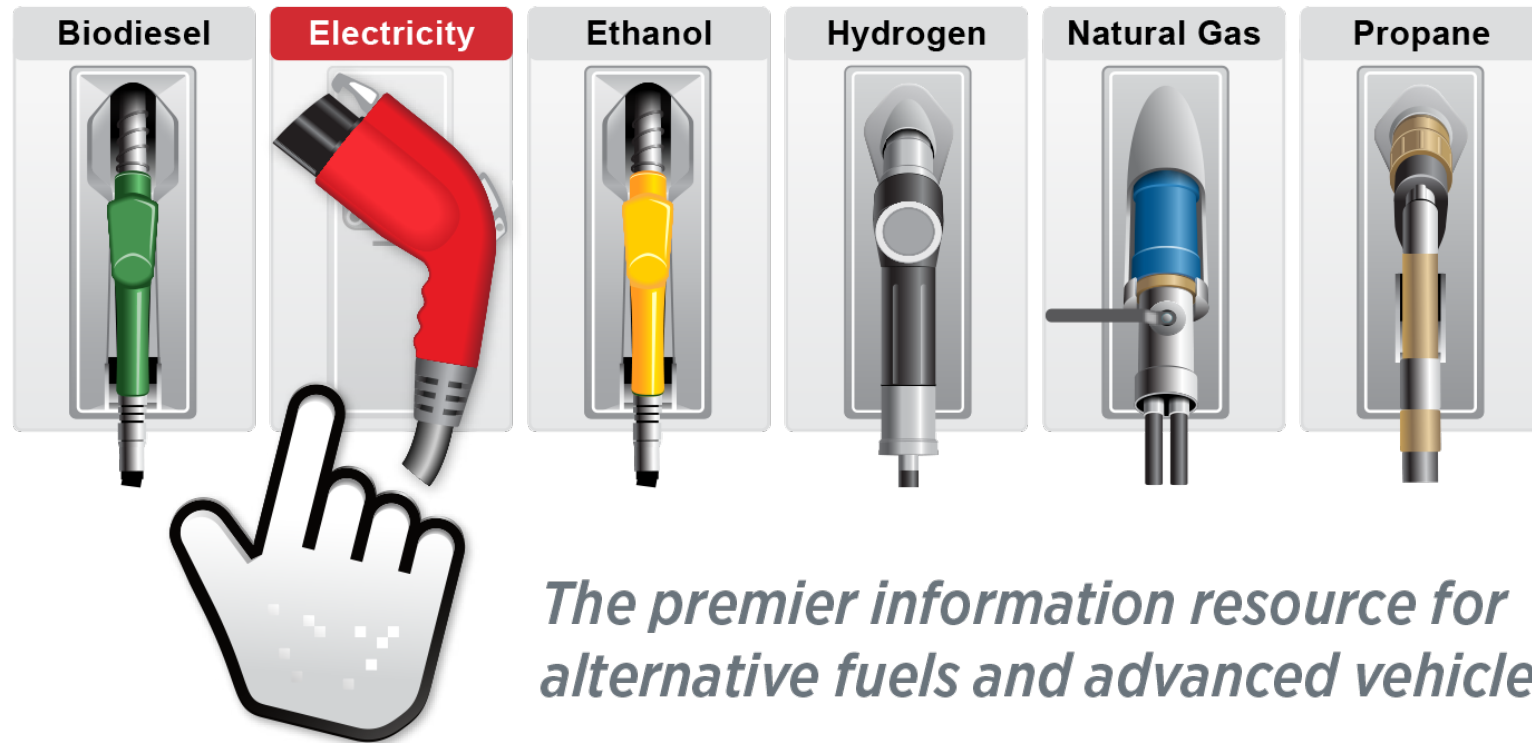


Alternative Fuels Data Center Station Locator and Corridor Tools

Matt Rahill and Johanna Levene
November 6, 2019



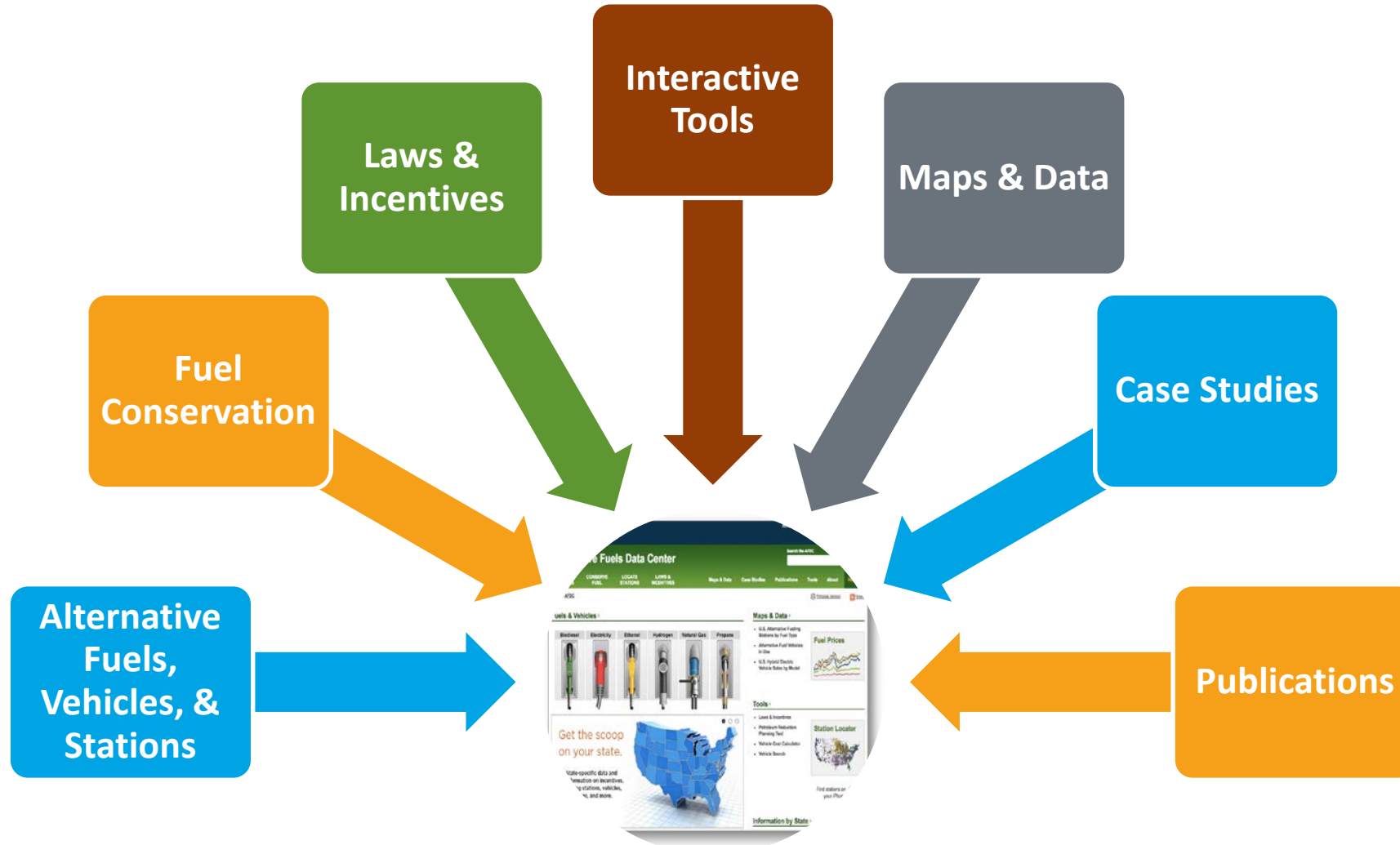
Alternative Fuels Data Center



*The premier information resource for
alternative fuels and advanced vehicles*

afdc.energy.gov

What does the AFDC provide?



Alternative Fuel Stations

afdc.energy.gov/stations

The screenshot displays the Alternative Fuels Data Center (AFDC) website. At the top, the U.S. Department of Energy logo is visible, along with the text "Energy Efficiency & Renewable Energy". The main header is "Alternative Fuels Data Center" with a search bar and a "SEARCH" button. Below the header, there are navigation tabs: "FUELS & VEHICLES", "CONSERVE FUEL", "LOCATE STATIONS" (which is highlighted), "LAWS & INCENTIVES", "Maps & Data", "Case Studies", "Publications", "Tools", "About", and "Home".

The main content area is titled "Alternative Fueling Station Locator". It includes a sub-header "Find alternative fueling stations in the United States and Canada. For U.S. stations, see [data by state](#). For Canadian stations in French, see [Natural Resources Canada](#)." Below this, there are two tabs: "Public Stations" and "Advanced Filters". To the right, it shows "29,060 results in" and a dropdown menu set to "U.S. and Canada".

The search interface includes a text input field "Enter location", a search icon, a dropdown menu for "All Fuels", and a "Map a Route" button. The main feature is a map of North America showing the locations of alternative fueling stations. A legend in the bottom right corner identifies the station types by color: Biodiesel (red), CNG (blue), Electric (green), Ethanol (yellow), Hydrogen (light blue), LNG (dark green), and Propane (purple). The map shows a high density of stations in the eastern and central United States, with fewer stations in the western United States and Canada. Major cities like Mexico City and San Francisco are labeled. The map is powered by Esri, HERE, Garmin, NGA, and USGS.

At the bottom of the page, there are links for "iPhone App for U.S. stations", "Android App for U.S. stations", "Developer APIs", "Embed Tool", "Submit New Station", and "About the Data".

Alternative Fuel Stations

Alternative Fueling Station Locator

Find alternative fueling stations in the United States and Canada. For U.S. stations, see [data by state](#). For Canadian stations in French, see [Natural Resources Canada](#).

Public Stations **Advanced Filters** 2,534 results in United States

Enter location Electric

IDAHO WYOMING NEVADA UTAH CALIFORNIA COLORADO ARIZONA NEW MEXICO

Elko Los Ranchos de Albuquerque

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Alternative Fuel Stations

Alternative Fueling Station Locator

Find alternative fueling stations in the United States and Canada. For U.S. stations, see [data by state](#). For Canadian stations in French, see [Natural Resources Canada](#).

Public Stations | Advanced Filters

Location | Fuel | Station

Filter by Fuel Type

- All Fuels
- Biodiesel (B20 and above)
- Compressed Natural Gas (CNG)
- Electric
- Ethanol (E85)
- Hydrogen
- Liquefied Natural Gas
- Propane (LPG)

Charger types: DC Fast

Connectors: CHAdeMO, SAE CCS

Networks: All

- All
- Blink
- ChargePoint
- Electrify America
- EV Connect
- EVgo

[clear all filters](#)

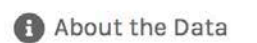
Map Results

37 stations
89 charging outlets

Filters chosen:

- Utah
- Electric
Types: DC Fast
Connectors/outlets: CHAdeMO, SAE CCS
- Access: Public

[Download Results](#)



Alternative Fuel Stations

Alternative Fueling Station Locator

Find alternative fueling stations in the United States and Canada. For U.S. stations, see [data by state](#). For Canadian stations in French, see [Natural Resources Canada](#).

Public Stations Advanced Filters

37 stations
89 charging outlets

Filters chosen:

- Utah
- Electric
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- Access: Public

Download Results

iPhone App
for U.S. stations

Android App
for U.S. stations

Developer APIs

Embed Tool

Submit New Station

About the Data

Resources for Nominating Corridors

Alternative Fuels Data Center

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Station Data for Nominating Alternative Fuel Corridors

The table below provides station data and shapefiles by state and fuel type. These datasets include public stations with the following filters applied to meet the criteria for nominating alternative fuel corridors:

- EV charging** – only DC fast electric vehicle (EV) charging stations with both CHAdeMO and CCS connectors, excluding Tesla
- Hydrogen** – only retail stations (Non-retail stations may be used in corridor nominations if the stations are compliant with SAE J2601 standards and meet all of the criteria for a hydrogen corridor.)
- Propane** – only "primary" liquefied petroleum gas (LPG) stations, which have fuel for vehicles and vehicle-specific fueling services that are consistently offered during business hours
- CNG** – only fast-fill compressed natural gas (CNG) stations that offer a fill pressure of 3,600 psi
- LNG** – all liquefied natural gas (LNG) stations

The data downloads are CSVs with current station data pulled automatically from the [Alternative Fueling Station Locator](#). The shapefiles are ZIP downloads with a static snapshot of the stations as of Oct. 13, 2019, including stations outside state borders within 25 miles.


























Learn more about corridor designations from the [Federal Highway Administration](#).



Explore Potential Corridors

Use the prototype mapping tool to explore potential corridors by fuel:

- EV charging
- Hydrogen
- Propane
- CNG
- LNG

Stations by State and Fuel Type					
State	EV Charging	Hydrogen	Propane	CNG	LNG
Alabama	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile
Alaska	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile
Arizona	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile
Arkansas	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile
California	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile

- CSV downloads
- Shapefiles
- Interactive maps

afdc.energy.gov/corridors

Demo: Interactive Maps for Nominating Corridors

Details Basemap Share Print Measure New Mexico

Legend

Compressed Natural Gas Stations (10/13/2019)

-

Alternative Fuel Corridors (10/13/2019)

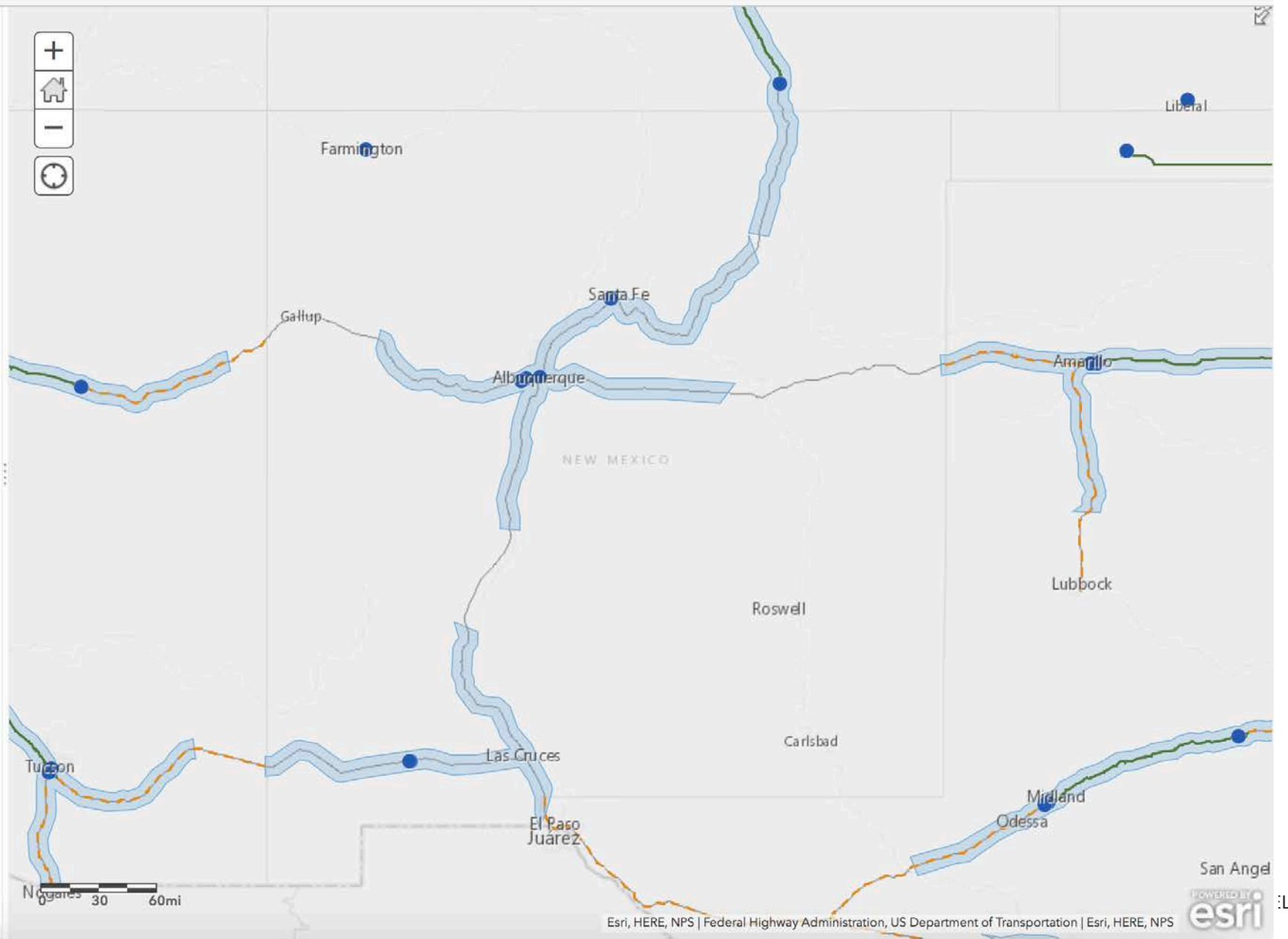
- Corridor Ready
- - Corridor Pending

Potential CNG Corridors: Roads with enough stations to 1) Nominate a corridor or 2) Create or extend a corridor by adding a station

National Highway Network

Interstates

Trust Center Legal Contact Esri Report Abuse



Details

Basemap

Share

Print

Measure

Nevada

Search icon



Legend

Propane Stations (10/13/2019)



Alternative Fuel Corridors (10/13/2019)

Corridor Ready

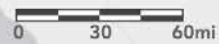
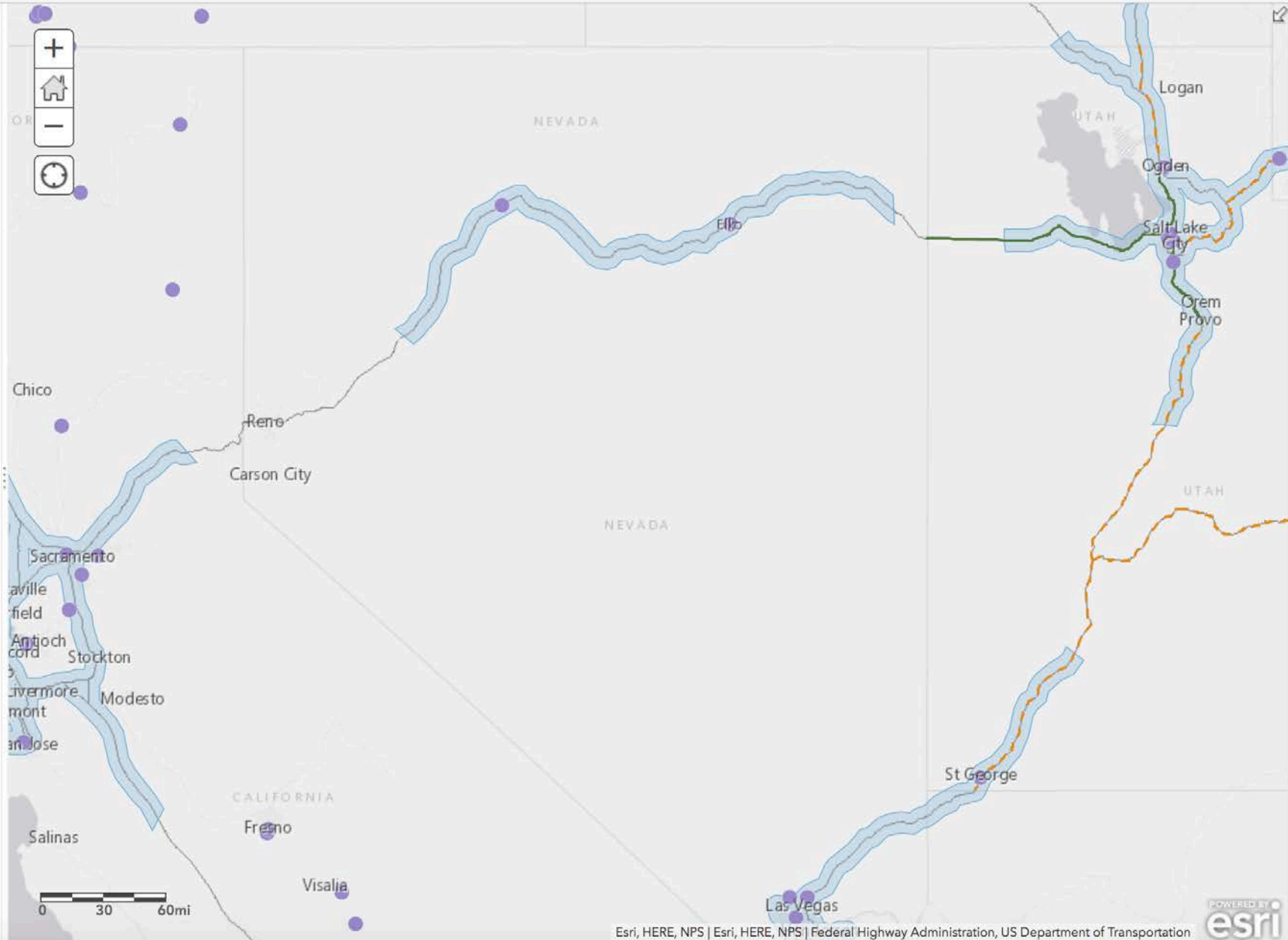
Corridor Pending

Potential LPG Corridors: Roads with enough stations to 1) Nominate a corridor or 2) Create or extend a corridor by adding a station



National Highway Network

Interstates



[Details](#) | [Basemap](#)

Share Print ▾ | Measure



Legend

Electric Stations (10/13/2019)



Alternative Fuel Corridors (10/13/2019)

Corridor Ready

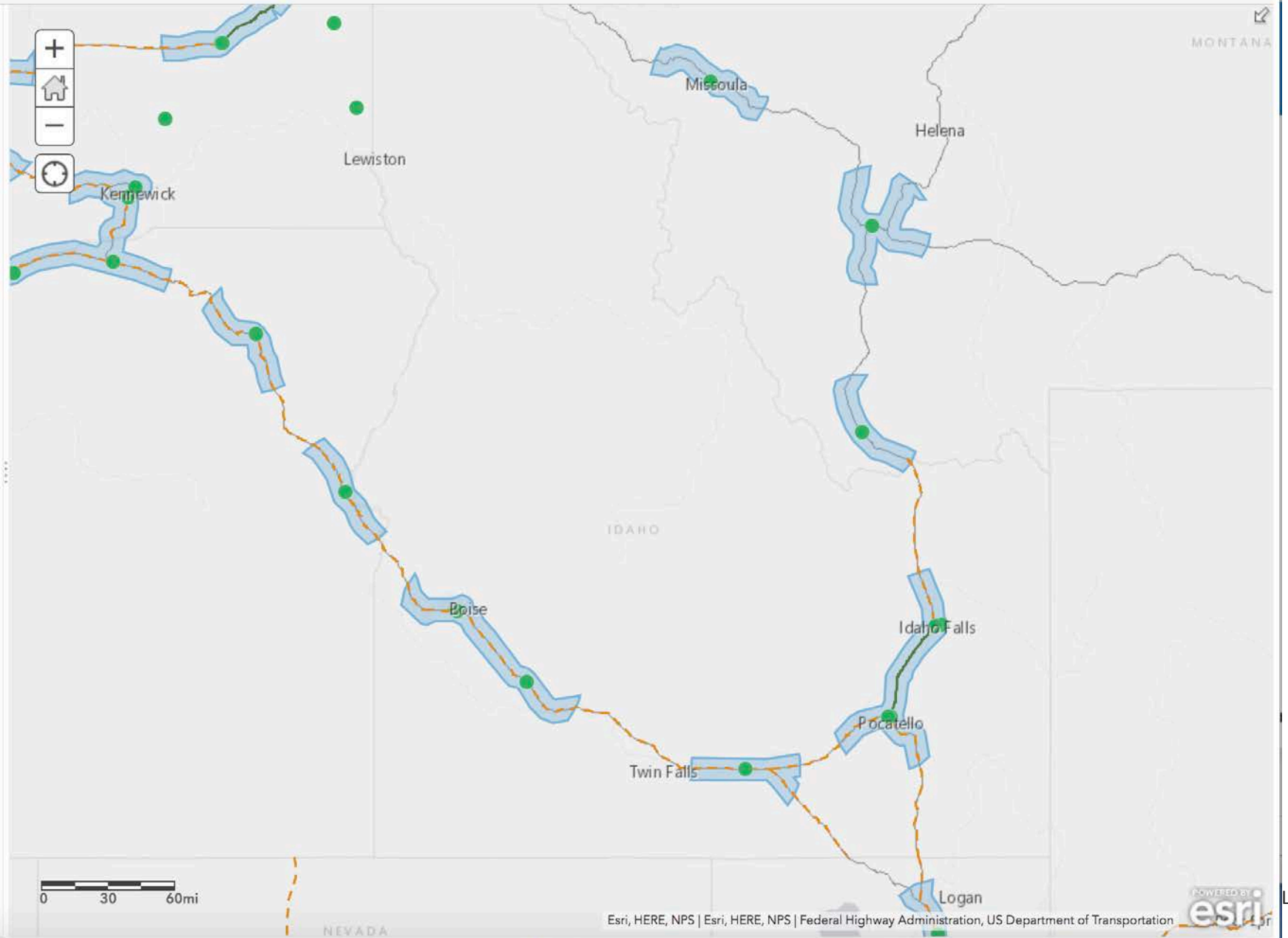
Corridor Pending

Potential Electric Corridors: Roads with enough stations to 1) Nominate a corridor or 2) Create or extend a corridor by adding a station



National Highway Network

Interstates



Demo: Tool for Measuring Corridors

This tool helps you measure the driving distance between stations that meet the criteria for alternative fuel corridors.

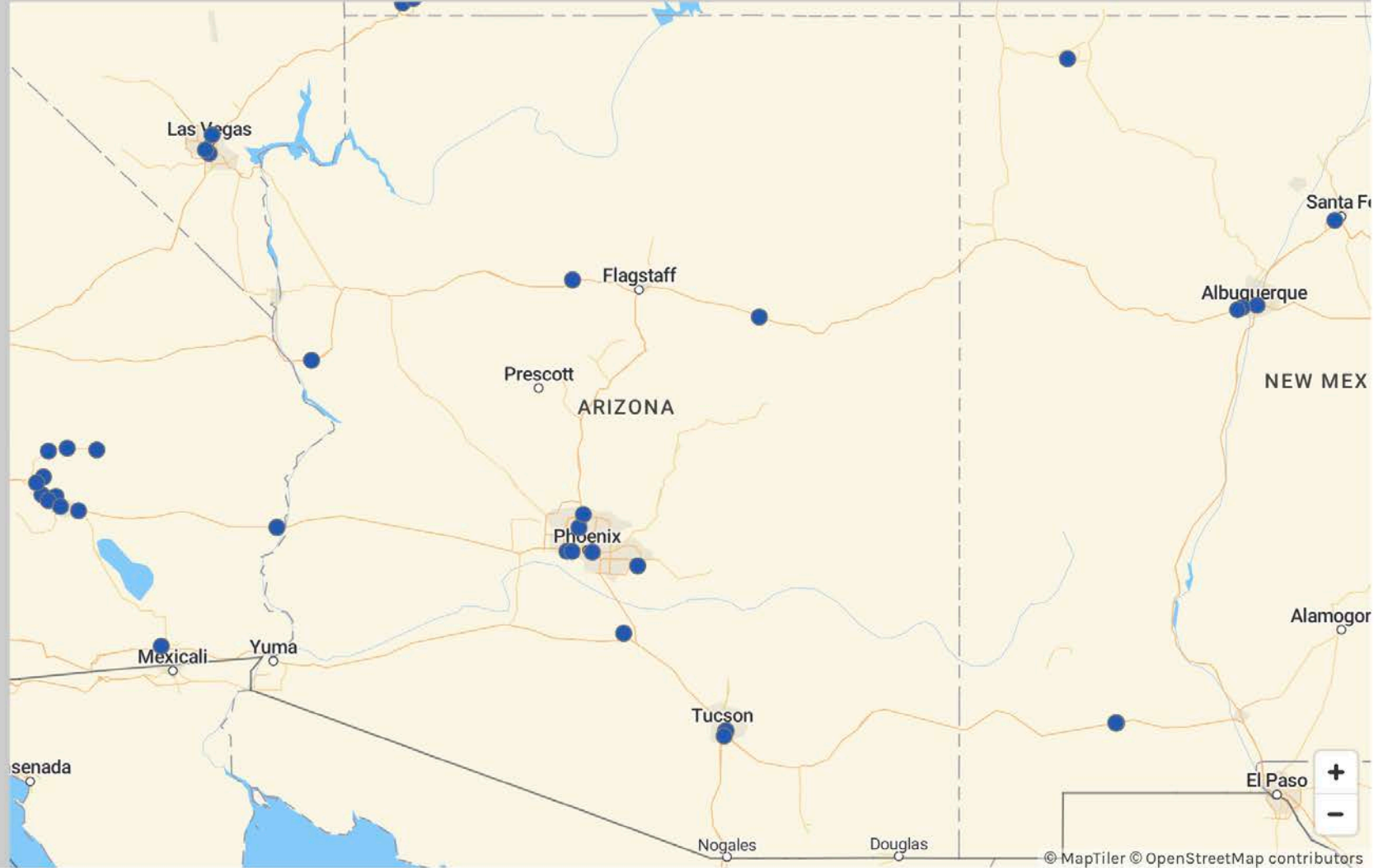
Compressed Natural Gas (CNG)

Starting Station

Select a station on the map to choose your starting point.

Ending Station

Select a station on the map to choose your ending point.



Explore more resources for nominating alternative fuel corridors, including data downloads and maps.

This tool helps you measure the driving distance between stations that meet the criteria for alternative fuel corridors.

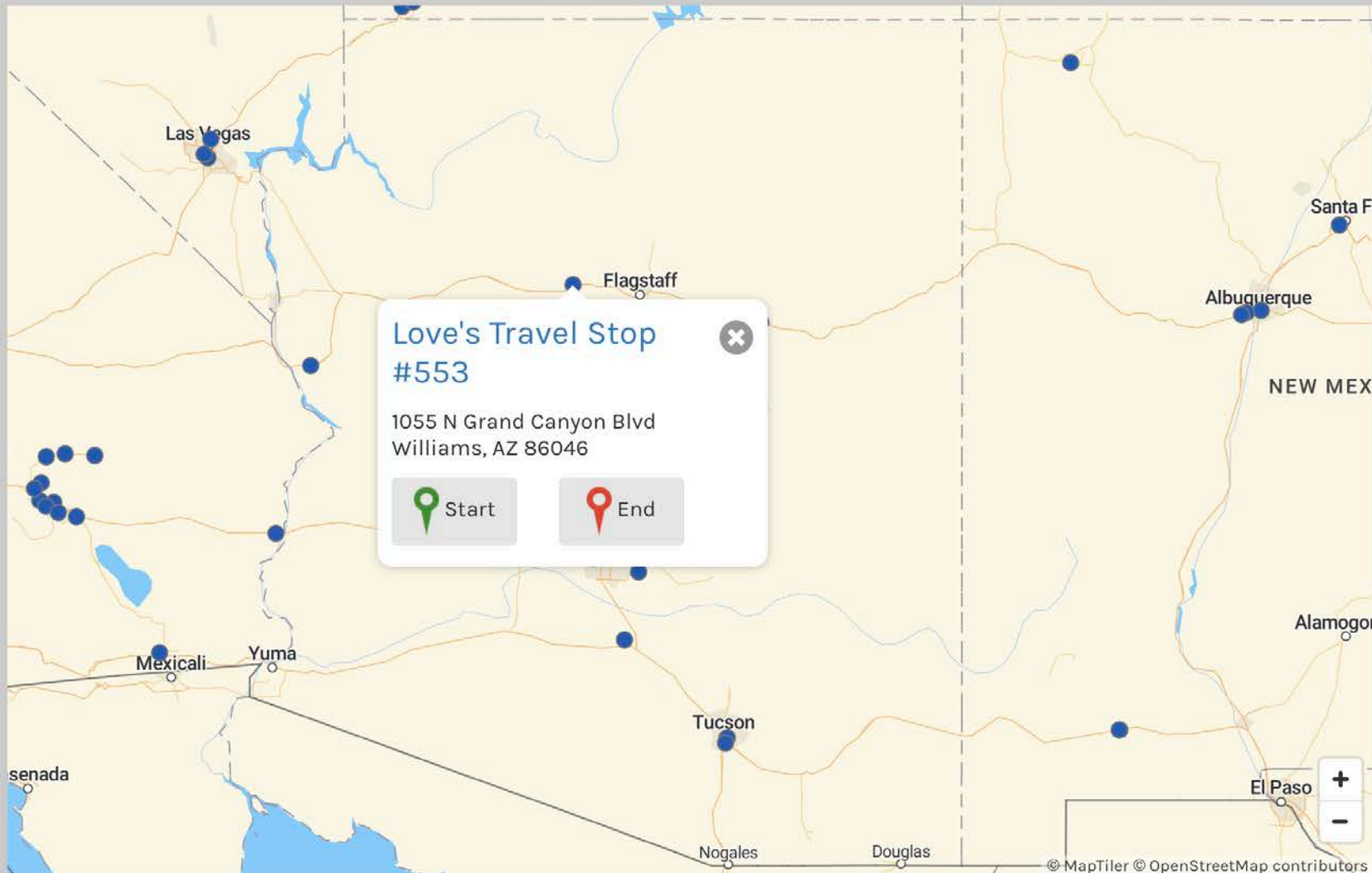
Compressed Natural Gas (CNG)

Starting Station

Select a station on the map to choose your starting point.

Ending Station

Select a station on the map to choose your ending point.



Explore more resources for nominating alternative fuel corridors, including data downloads and maps.

This tool helps you measure the driving distance between stations that meet the criteria for alternative fuel corridors.

Compressed Natural Gas (CNG)

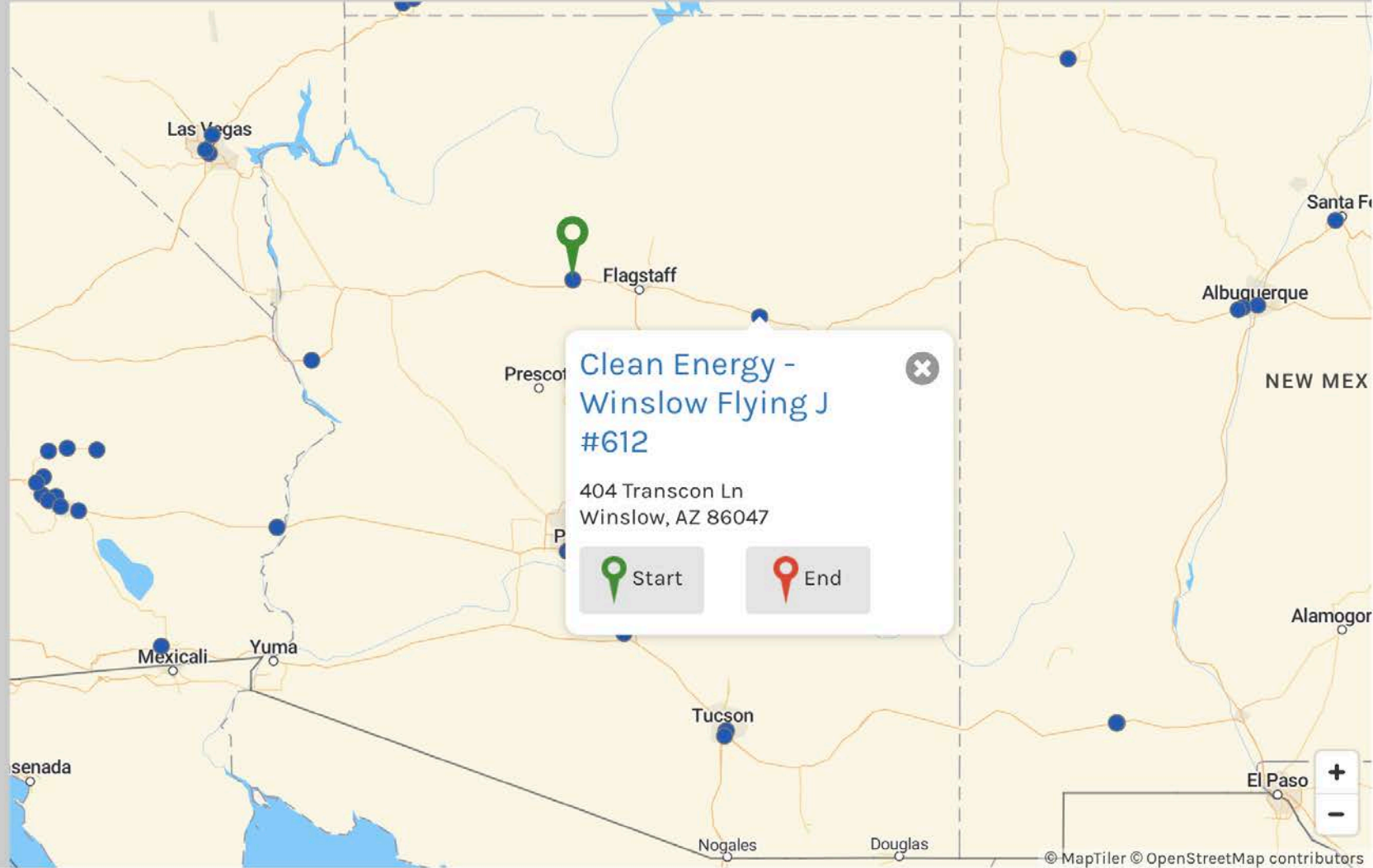
Starting Station


 **Love's Travel Stop #553** 

1055 N Grand Canyon Blvd
Williams, AZ 86046

Ending Station

Select a station on the map to choose your ending point.



 Explore more [resources for nominating alternative fuel corridors](#), including data downloads and maps.

This tool helps you measure the driving distance between stations that meet the criteria for alternative fuel corridors.

Compressed Natural Gas (CNG)

Starting Station

Love's Travel Stop #553
1055 N Grand Canyon Blvd
Williams, AZ 86046

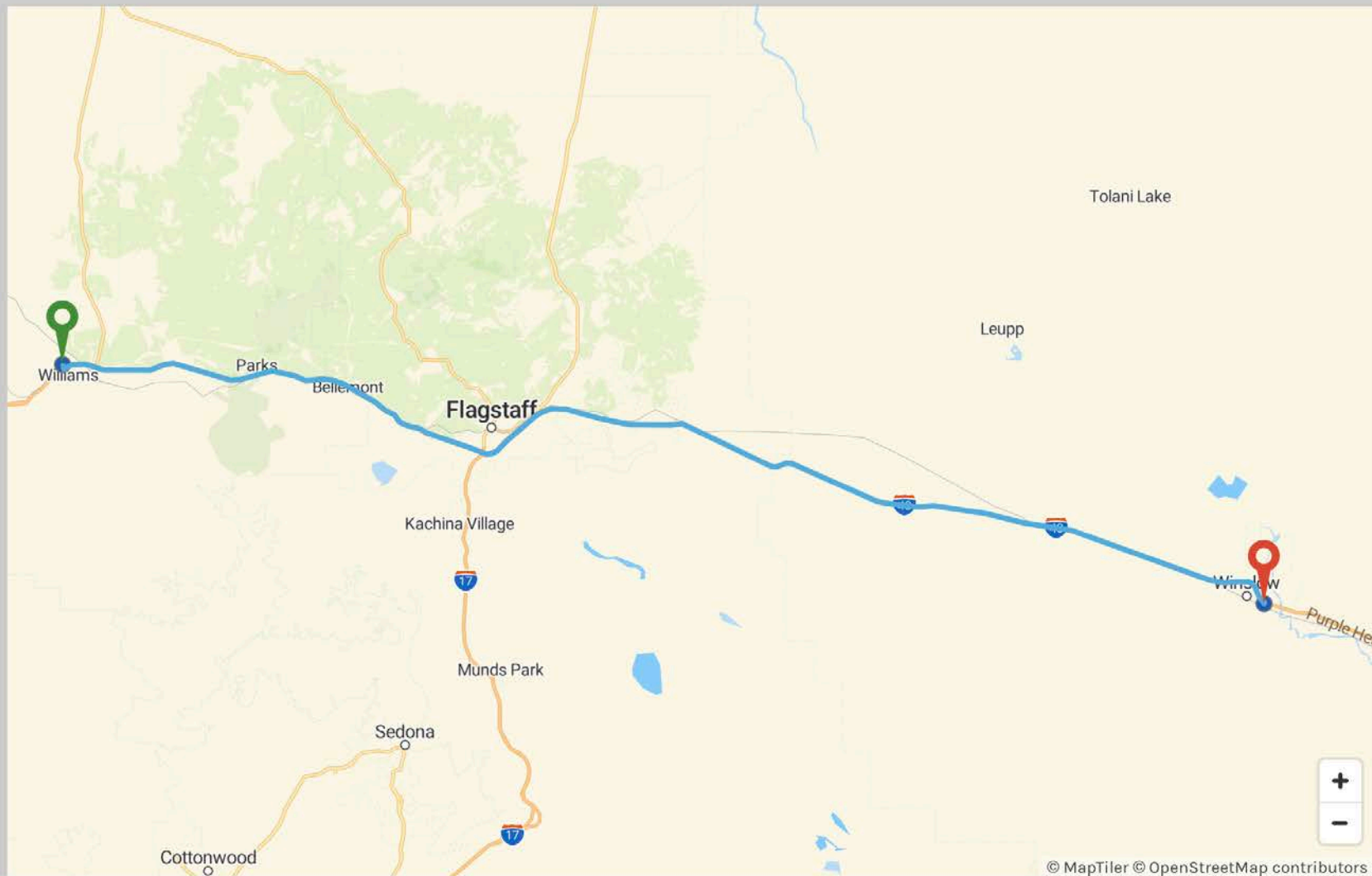
Ending Station

Clean Energy - Winslow
Flying J #612
404 Transcon Ln
Winslow, AZ 86047

93 miles

driving distance between the stations

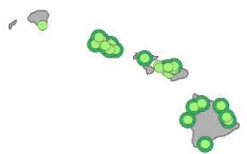
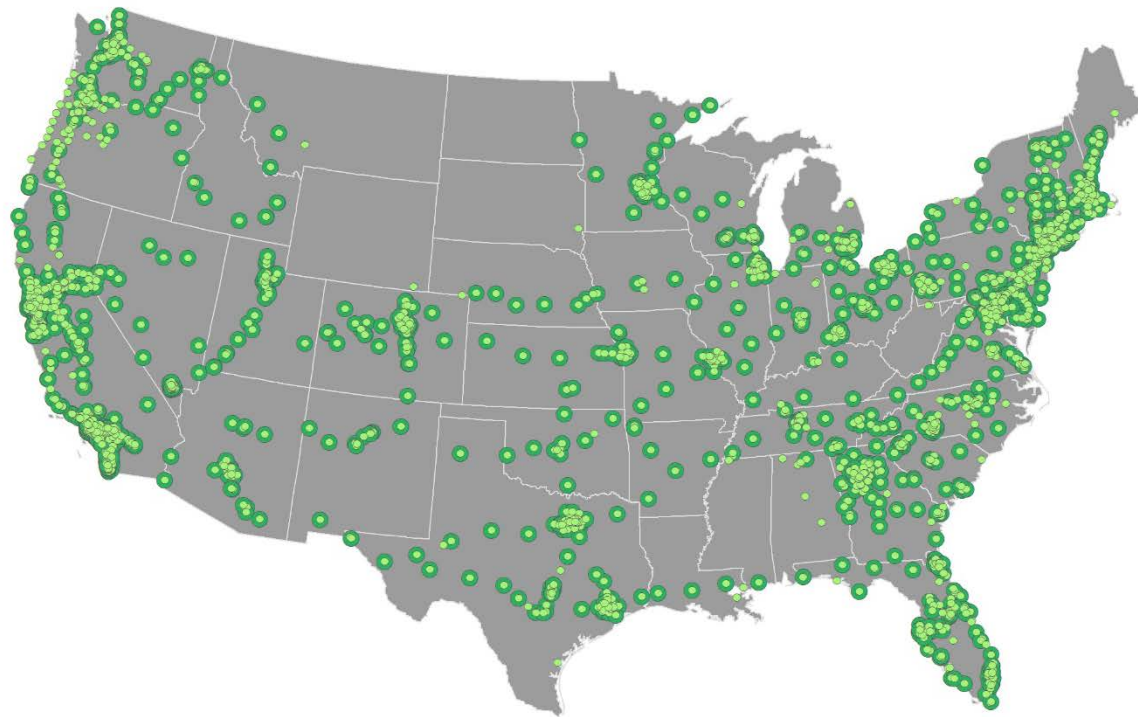
Explore more resources for nominating alternative fuel corridors, including data downloads and maps.



© MapTiler © OpenStreetMap contributors

Round 4 – Changing Electric Charging Station Requirements

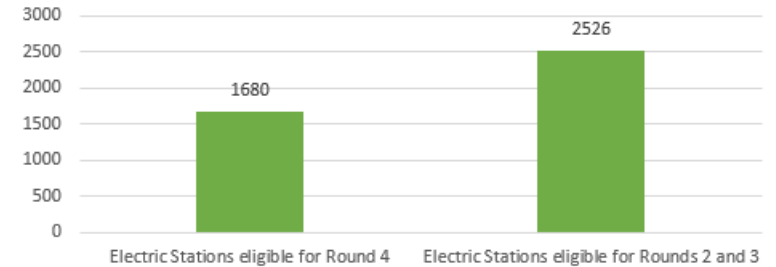
Electric Charging Station Distribution in the United States



Electric Charging Stations

- Eligible for Round 2 and 3
- Eligible for Round 4

AFC Eligible U.S. Electric Stations

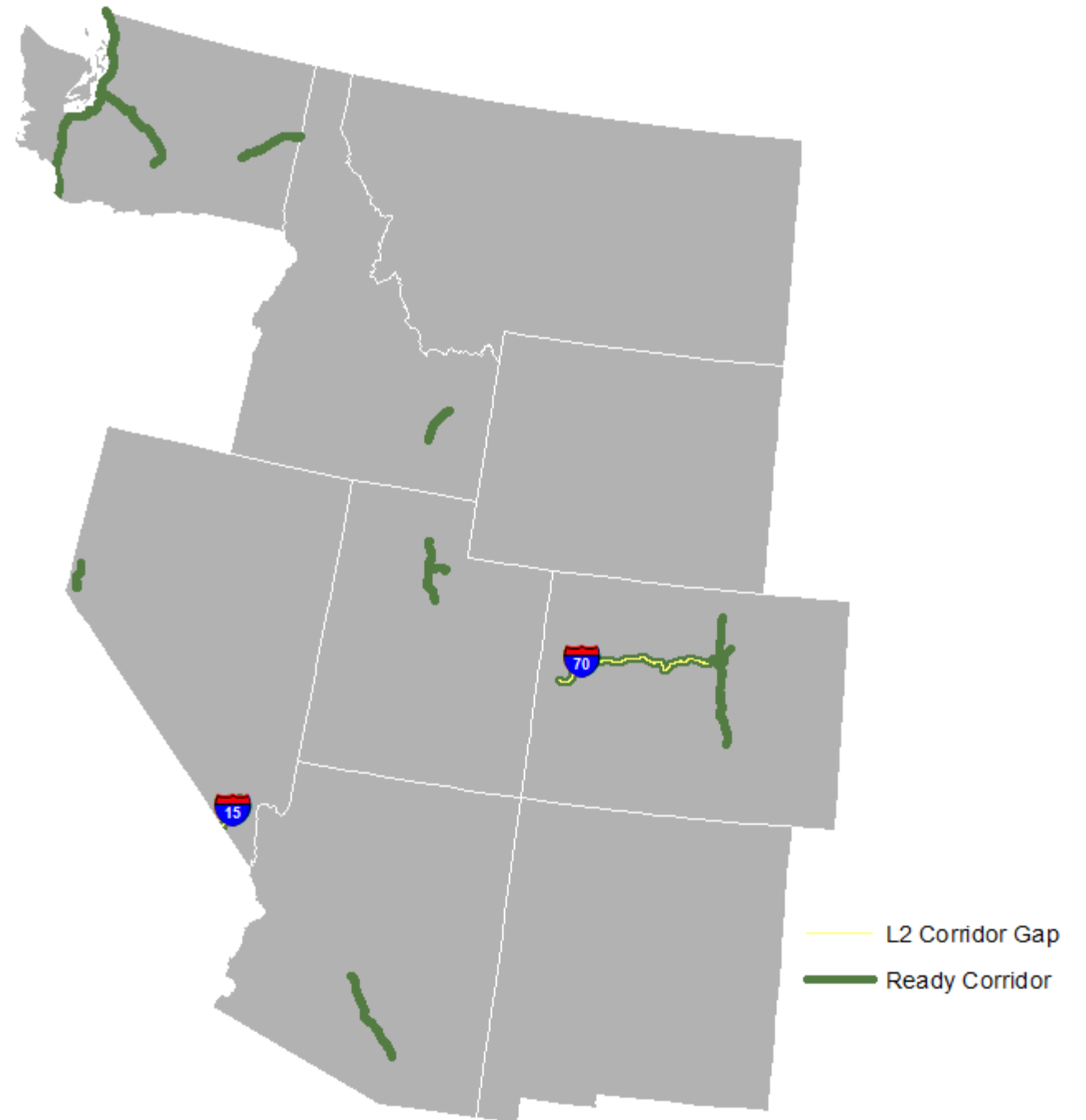


Changing electric station requirements from DC Fast to DC Fast with both CHAdeMO and CCS connectors will reduce the number of stations eligible for round 4 alternative fuel corridor nominations by 33%.

Alternative Fuels Data Center,
National Renewable Energy Laboratory, 10/14/2019

Round 1 Electric Corridor Resiliency Evaluation

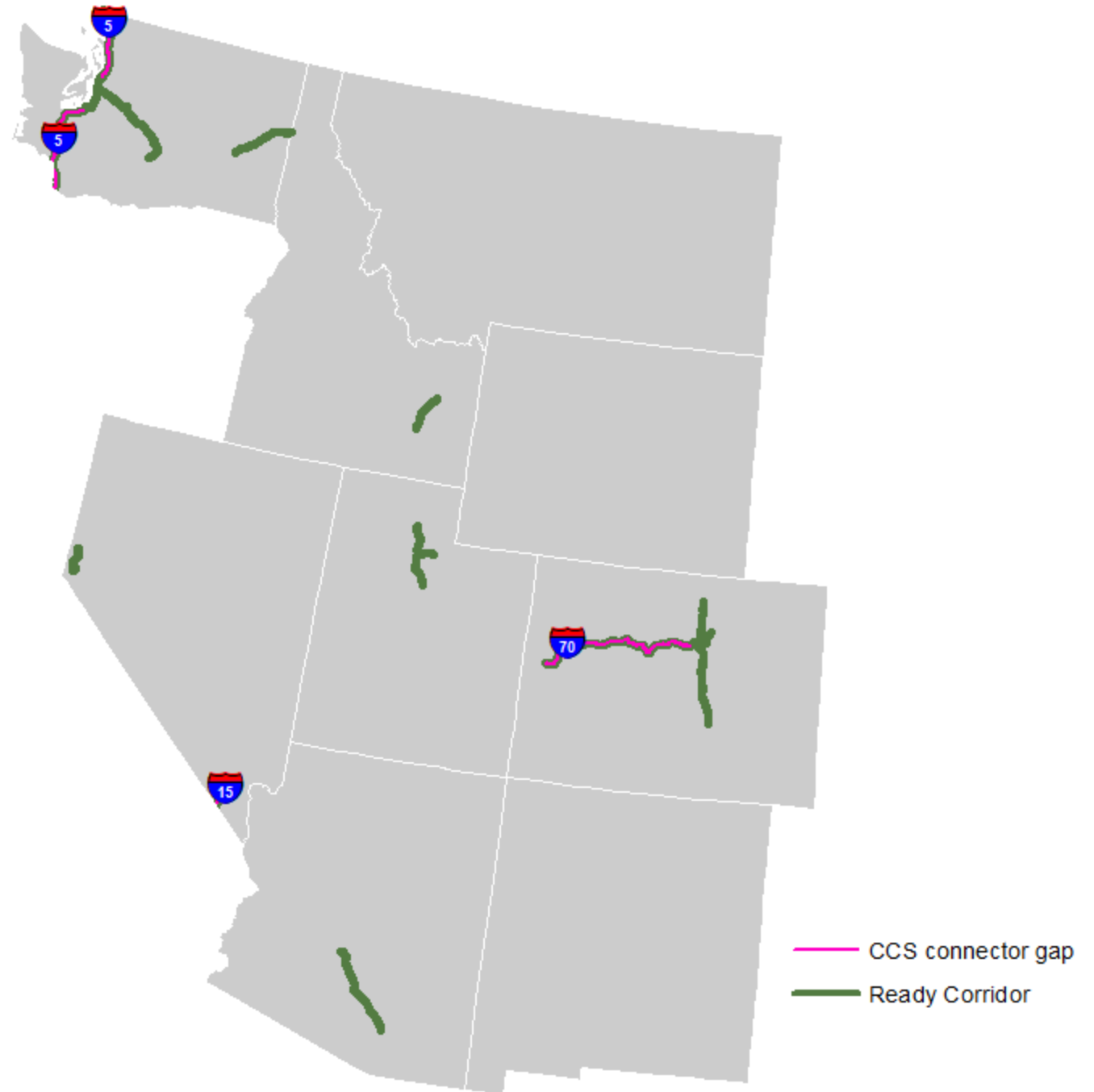
Highway sections, shown in yellow, were awarded corridor status in Round 1 with Level 2 chargers but need additional DC Fast installations for future designation.



Future Electric Corridor Considerations – DC Fast Charger Types

Electric vehicles charge using a specific connector. A CCS connector vehicle would have gaps charging along corridor segments shown in pink.

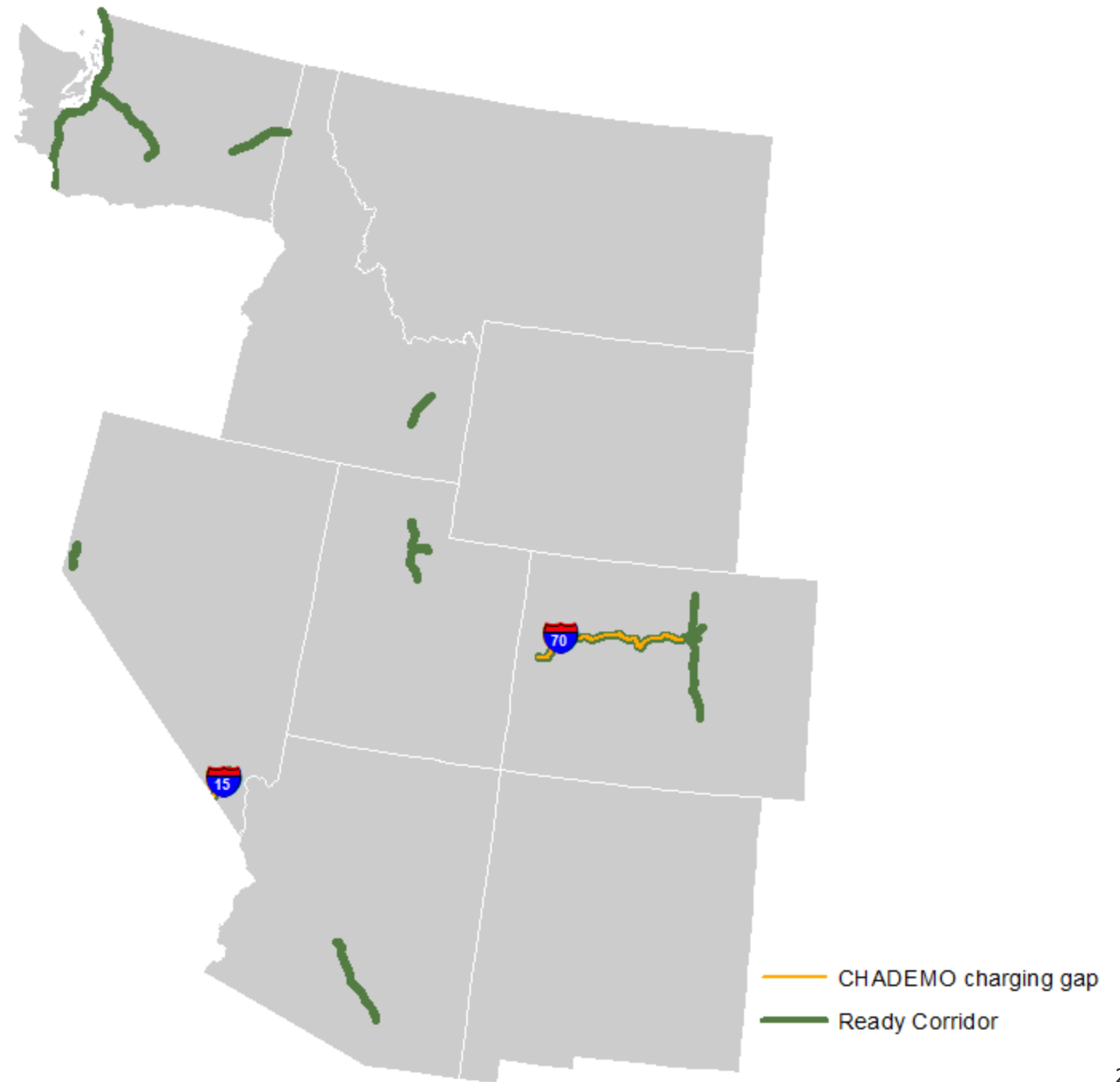
Note, some gaps are due to level 2 chargers.



Future Electric Corridor Considerations – DC Fast Charger Types

Electric vehicles charge using a specific connector. A CHAdeMO connector vehicle would have gaps charging along corridor segments shown in gold.

Note, some gaps are due to level 2 chargers.



Round 1 and 2 Corridor Refresh – CNG Example

- Corridors designated as pending in rounds 1 and 2 are being reevaluated to determine if criteria are met for ready status.
- Methodologies are being developed to evaluate pending corridors.
- Example: Find CNG stations opened since round 1 nominations and evaluate pending corridors near those stations.



- New stations since November 2016
- Past pending corridors now ready
- Current Stations

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Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite

This tool provides a simple way to estimate how much electric vehicle charging you might need at a city- and state-level.

How Much Electric Vehicle Charging Do I Need in My Area?



A tool to provide a simple way to estimate how much electric vehicle charging you might need at a city- and state-level.

EVI-Pro Lite

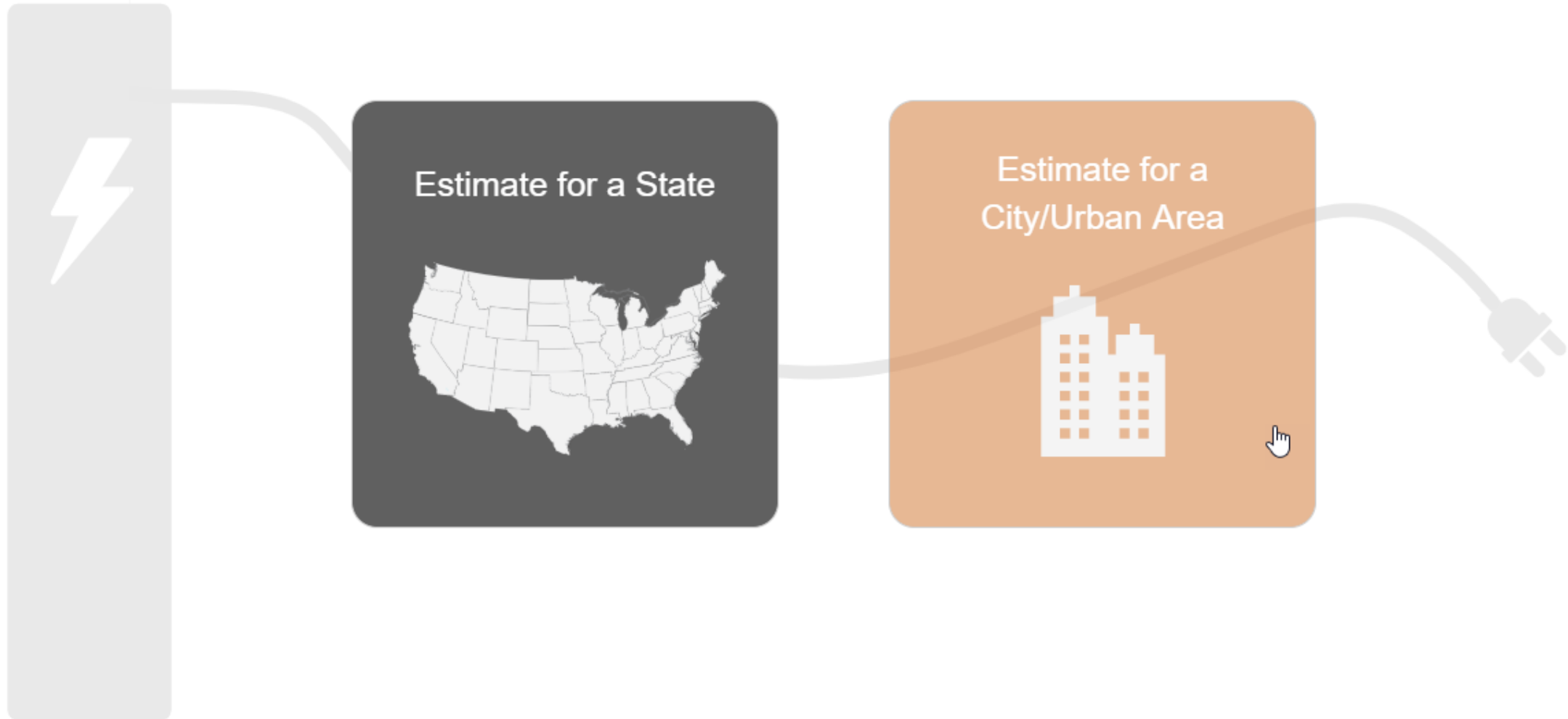
afdc.energy.gov/evi-pro-lite



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State



City/Area



Vehicles

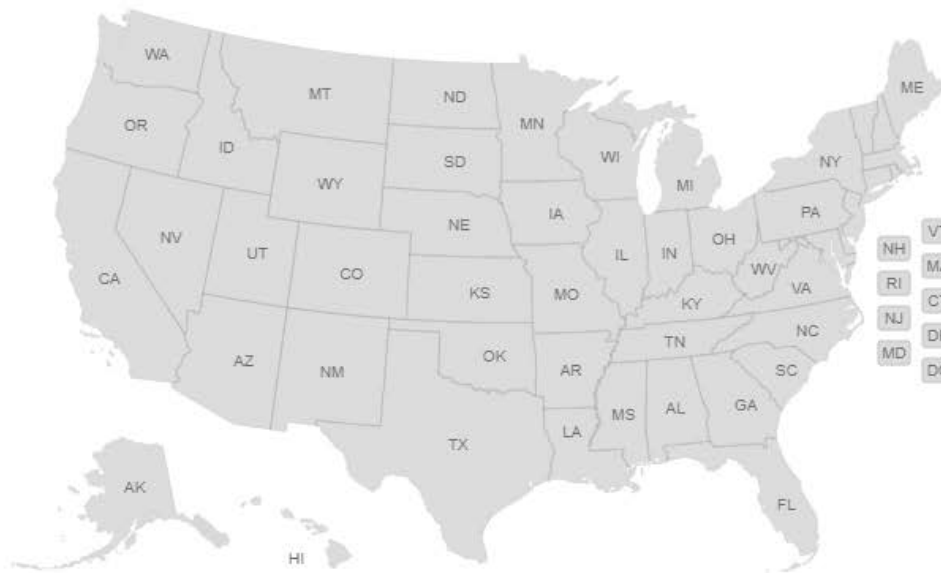


Results

Start Over

Choose a State

Select State



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How Much Electric Vehicle Charging Do I Need in My Area?

State

City/Area

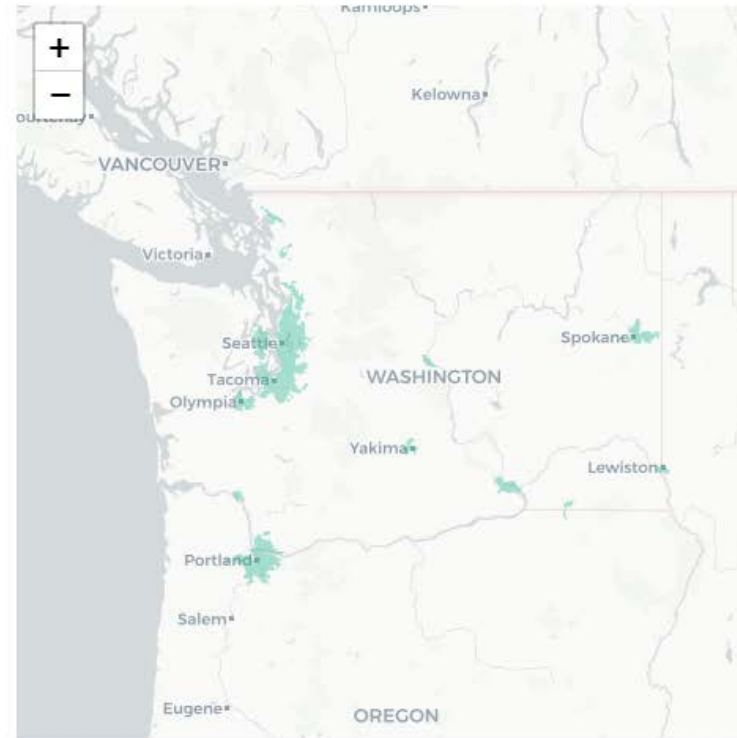
Vehicles

Results

Start Over

Choose a major urban area in Washington

- | | |
|-----------------|---------------|
| Bellingham | Bremerton |
| Kennewick-Pasco | Lewiston |
| Longview | Marysville |
| Mount Vernon | Olympia-Lacey |
| Portland | Seattle |
| Spokane | Walla Walla |
| Wenatchee | Yakima |



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This tool provides a simple way to estimate how much electric vehicle charging you might need at a city- and state-level.

How Much Electric Vehicle Charging Do I Need in My Area?



State



City/Area



Vehicles



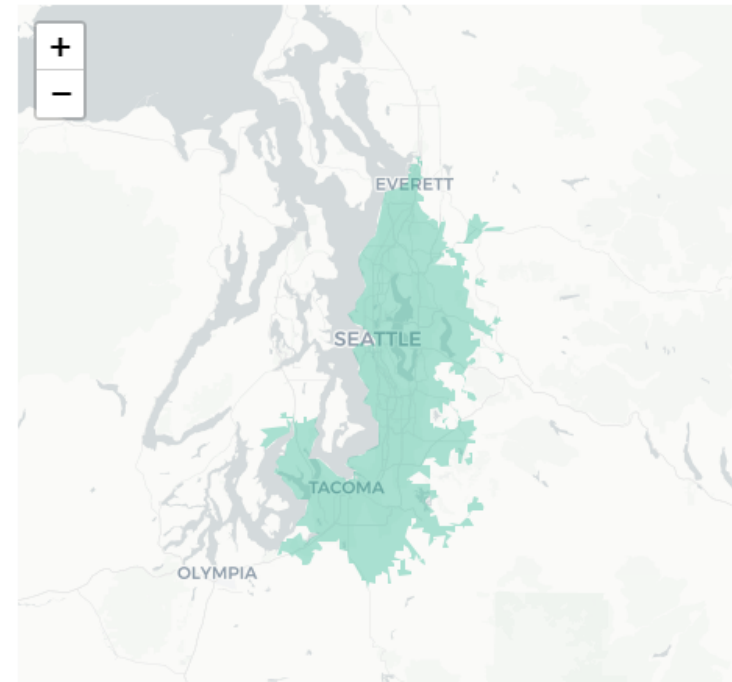
Results

Start Over

How many plug-in electric vehicles would you like to support in Seattle?

For reference, there were 2,874,000 light-duty vehicles on the road in the Seattle area as of the end of 2016 and 14,800 of those were plug-in electric vehicles.

Calculate



Your Results

In the Seattle area, to support 30,000 plug-in electric vehicles you would need:

651 Workplace Level 2 Charging Plugs

475 Public Level 2 Charging Plugs

There are currently 1,257 plugs with an average of 2.7 plugs per charging station per the Department of Energy's [Alternative Fuels Data Center Station Locator](#).

88 Public DC Fast Charging Plugs

There are currently 146 plugs with an average of 2.8 plugs per charging station per the Department of Energy's [Alternative Fuels Data Center Station Locator](#).

Where Do I Start?

Planners may want to prioritize installation of fast charging infrastructure above Level 2 charging.

Build DC Fast First: Establishing fast charging networks that enable long-distance travel, serve as charging safety nets, and provide charging for drivers without home charging is critical to support all-electric vehicles that have no other alternative for quickly extending their driving range.

Build Level 2 Second: EVI-Pro typically simulates the majority of Level 2 charging demand coming from plug-in hybrid electric vehicles, which have the ability to use gasoline as necessary for quickly extending driving range.

Change Assumptions

Plug-in Electric Vehicles (as of 2016): 14,800

Light Duty Vehicles (as of 2016): 2,874,000

Number of vehicles to support

Vehicle Mix	
Plug-in Hybrids 20-mile electric range	<input type="text" value="15"/> %
Plug-in Hybrids 50-mile electric range	<input type="text" value="35"/> %
All-Electric Vehicles 100-mile electric range	<input type="text" value="15"/> %
All-Electric Vehicles 250-mile electric range	<input type="text" value="35"/> %
Total	100%

How much support do you want to provide for plug-in hybrid electric vehicles (PHEVs)?

- Full Support**
Most PHEV drivers wouldn't need to use gasoline on a typical day.
- Partial Support**
Calculate using half of full support assumption.
- Do not count PHEVs in charging demand estimates.**

Percent of drivers with access to home charging %

Recalculate

[See all assumptions.](#)

What's Next?

Armed with an estimate of how much electric vehicle charging you might need, you may still have some questions.



Where do I put stations?

A good place to start is mapping where they already exist using the [Alternative Fuels Data Center Station Locator](#). Also, review this National Renewable Energy Laboratory report to learn about how the detailed version of EVI-Pro was used to determine candidate sites in [Columbus, Ohio](#).



How much does a station cost?

Recent studies by the National Renewable Energy Laboratory and Idaho National Laboratory have examined capital costs of current and future charging stations.

- [Costs Associated with Non-Residential Electric Vehicle Supply Equipment](#)
- [National Economic Value Assessment of Plug-In Electric Vehicles](#)
- [Considerations for Corridor and Community DC Fast Charging Complex System Design](#)



What are the projections for plug-in electric vehicle growth?

The U.S. Energy Information Administration's [Annual Energy Outlook](#) is one resource for vehicle sales projections. Additional projections are made by private consulting firms.



What are some site-specific considerations?

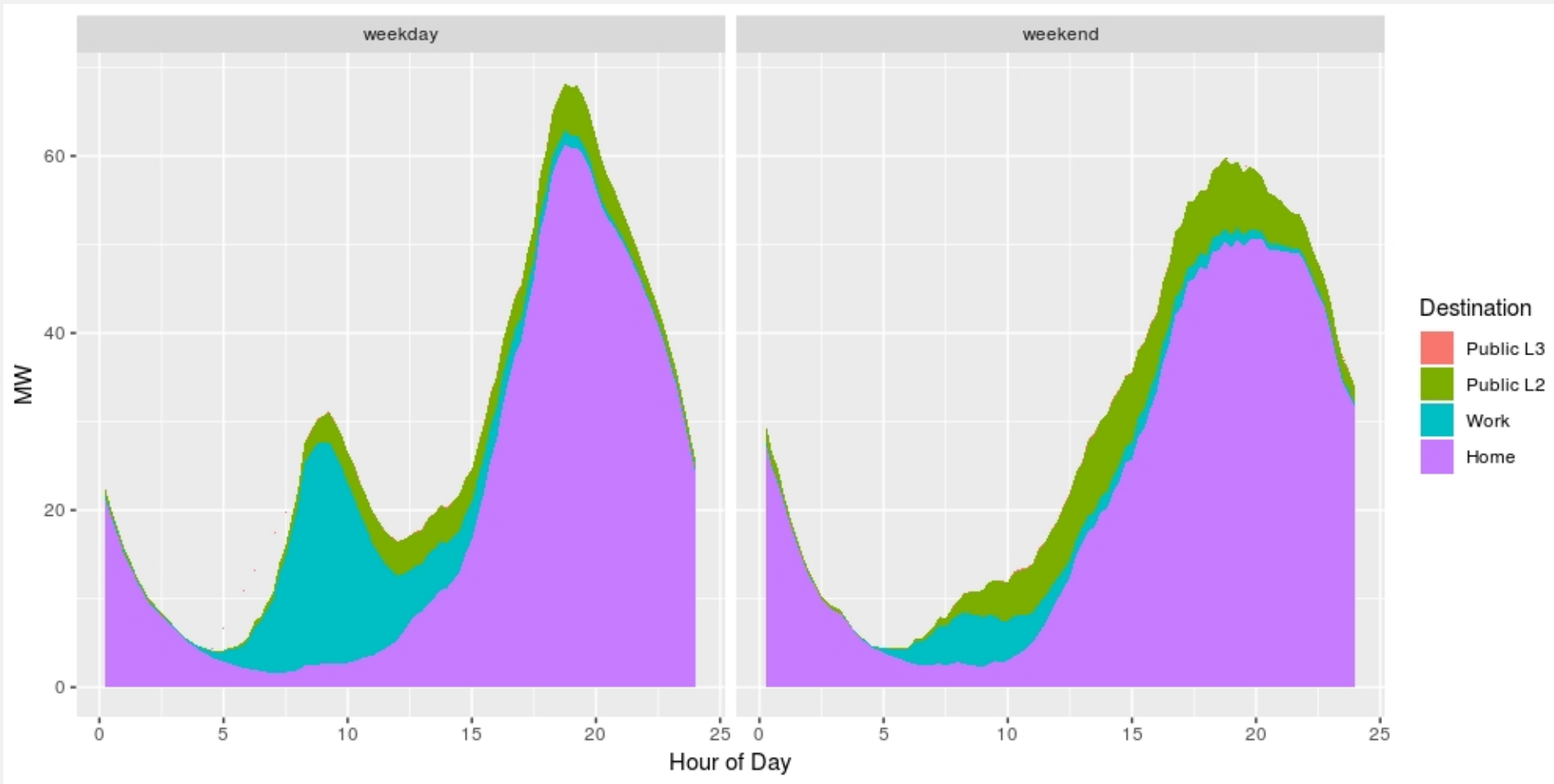
Find more information about charging at these sites.

- [Charging at home](#)
- [Multi-Unit dwelling charging](#)
- [Charging in public](#)
- [Workplace charging](#)



Still have questions?

If you need technical assistance or have questions about EV infrastructure contact your local [Clean Cities coalition](#). For questions about the EVI Pro model, contact [webmaster](#).



**Coming
September 2020**

- Estimate load profiles for EV charging.
- More discreet city/town areas can be evaluated.

Future Enhancement – Load Profile & Discreet Geographies

Thank You

www.nrel.gov

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matt.rahill@nrel.gov

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