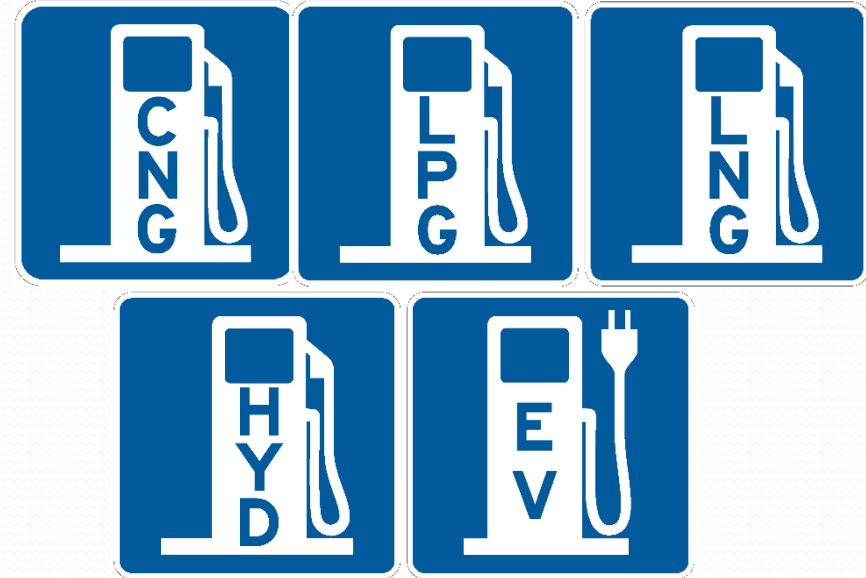


South Central Corridor Analysis and Planning Tools

April 9, 2019



Mike Scarpino
Stephen Costa

Volpe The National Transportation Systems Center
Advancing transportation innovation for the public good

Johanna Levene
Steve Lommelle

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

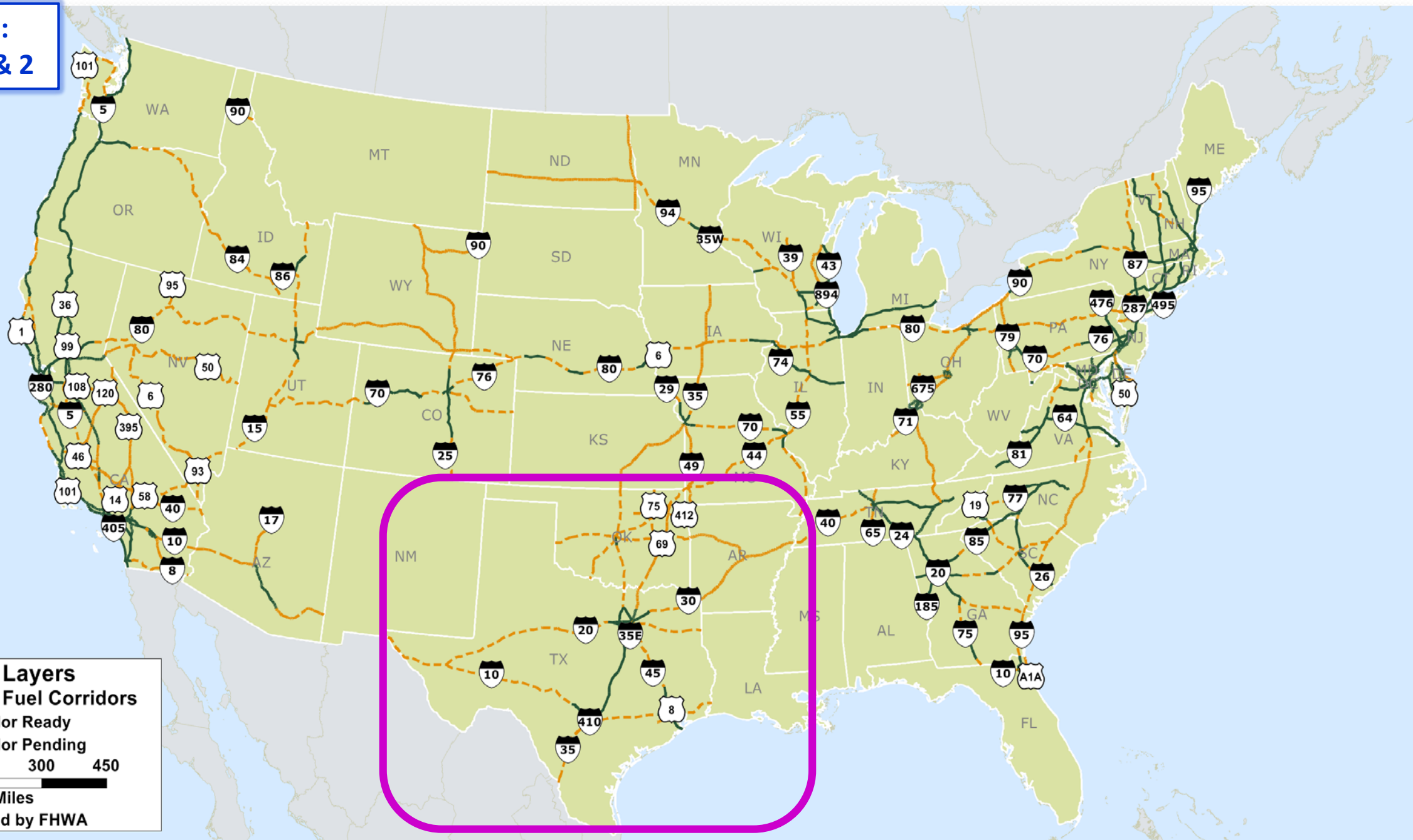
BEGIN

**ALTERNATIVE
FUELS
CORRIDOR**



- ✓ **Current Designated Round 1 & 2 AFC Maps**
- ✓ **VMT & Freight Data**
 - ✓ **2012 and 2045 Projections for TX, OK, AR, LA**
- ✓ **Round 1 & 2 “refresh” results by fuel for TX, OK, AR, LA**
- ✓ **Level 2 & Connector Type Resiliency Analysis**
- ✓ **Alternative Fuels Data Center (AFDC) Overview**
- ✓ **AFDC Corridor Tools Overview & Demo**
- ✓ **Electric Vehicle Infrastructure Pro Lite (EVI-Pro) Demo**

**EV AFC's:
Rounds 1 & 2**



Map Layers

- EV - Corridor Ready
- EV - Corridor Pending

0 150 300 450

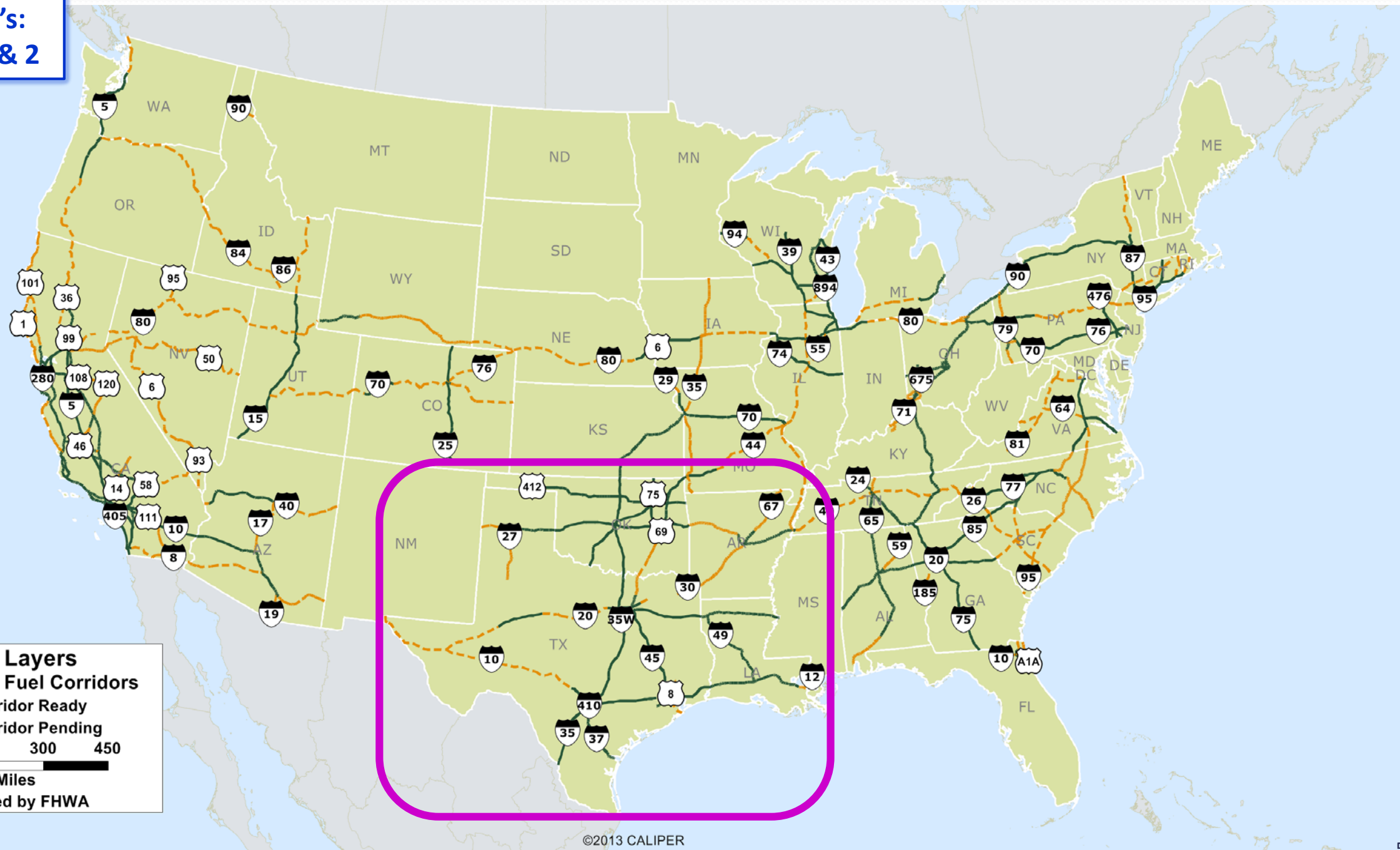
Miles

Prepared by FHWA

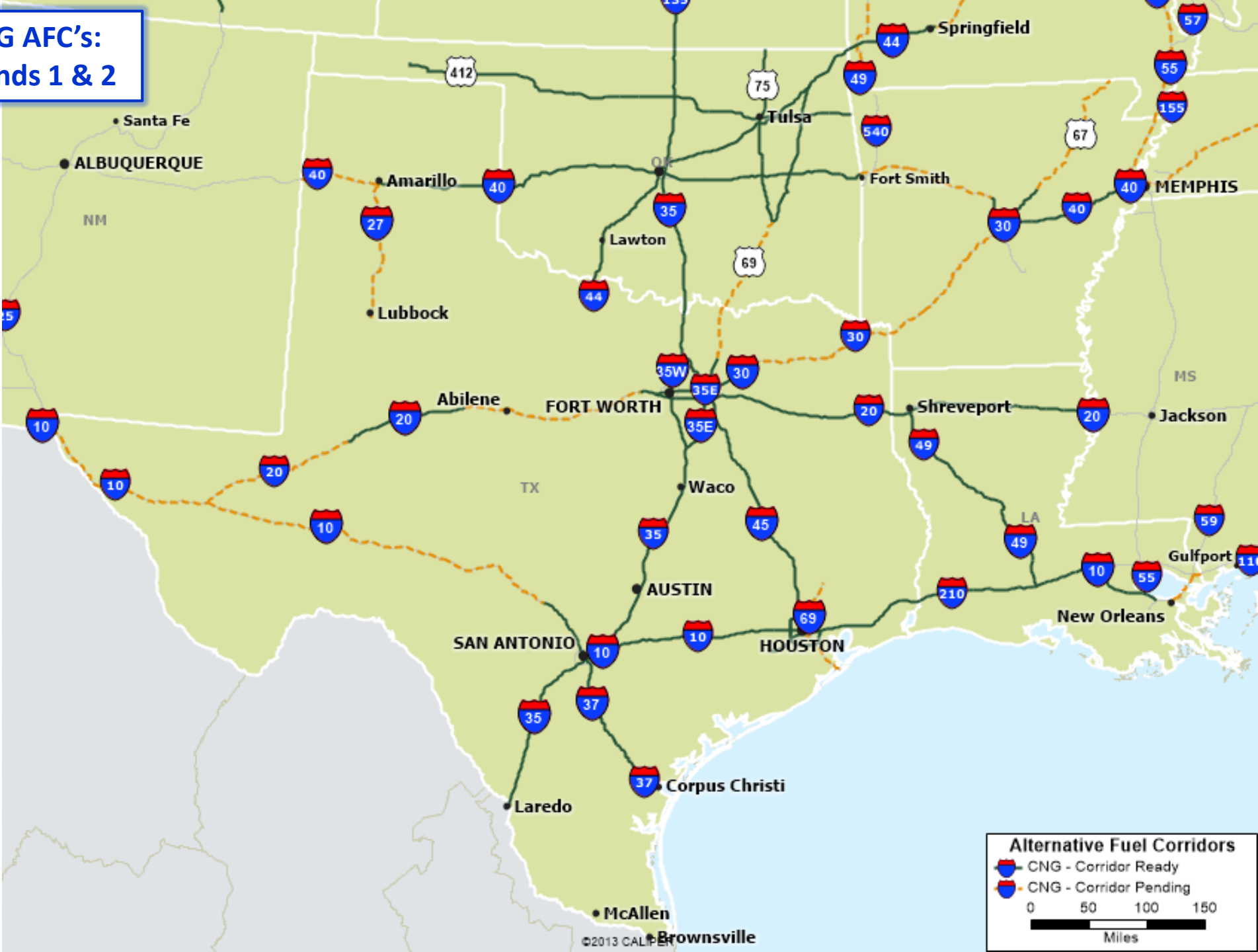
**EV AFC's:
Rounds 1 & 2**



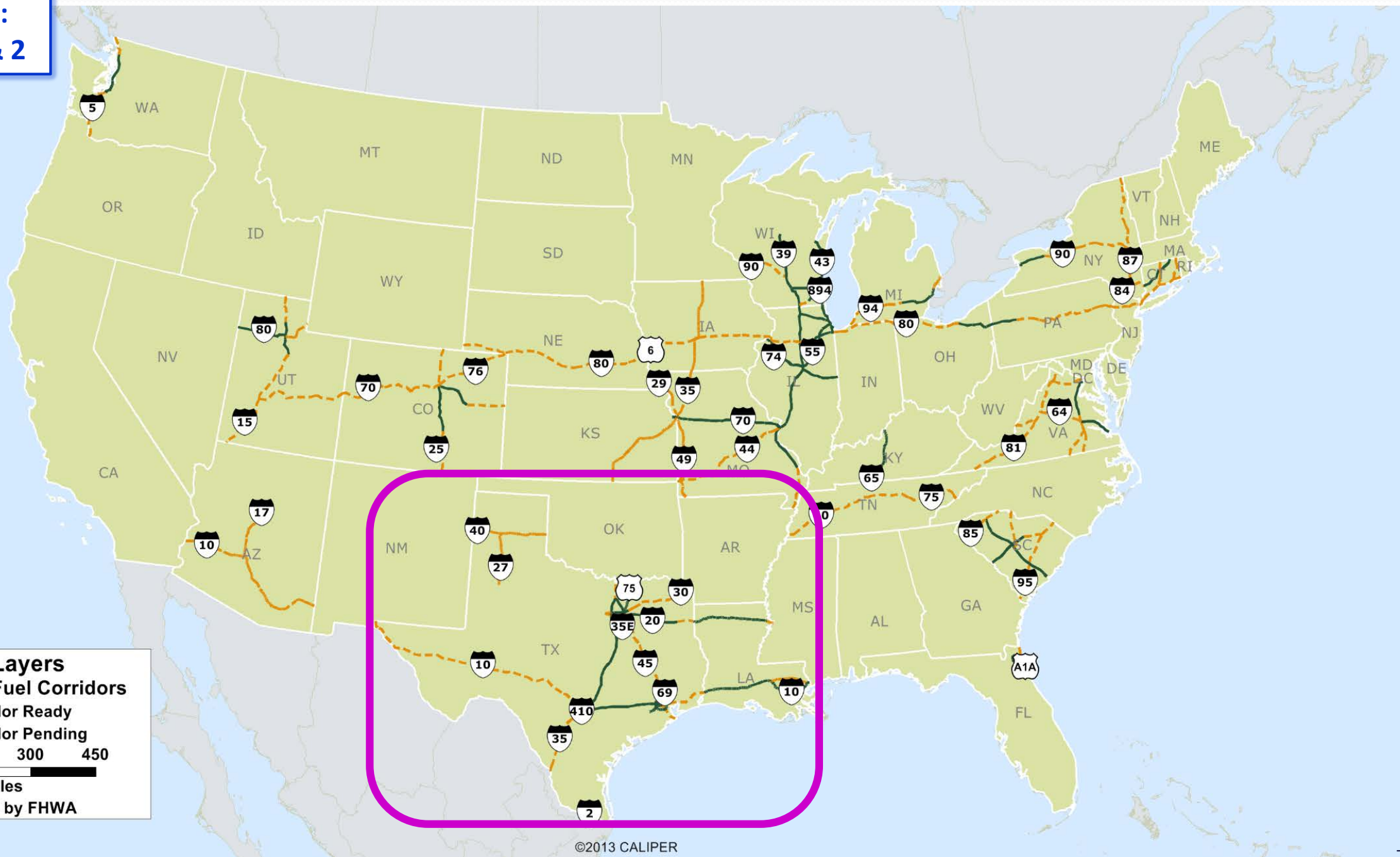
**CNG AFC's:
Rounds 1 & 2**



**CNG AFC's:
Rounds 1 & 2**



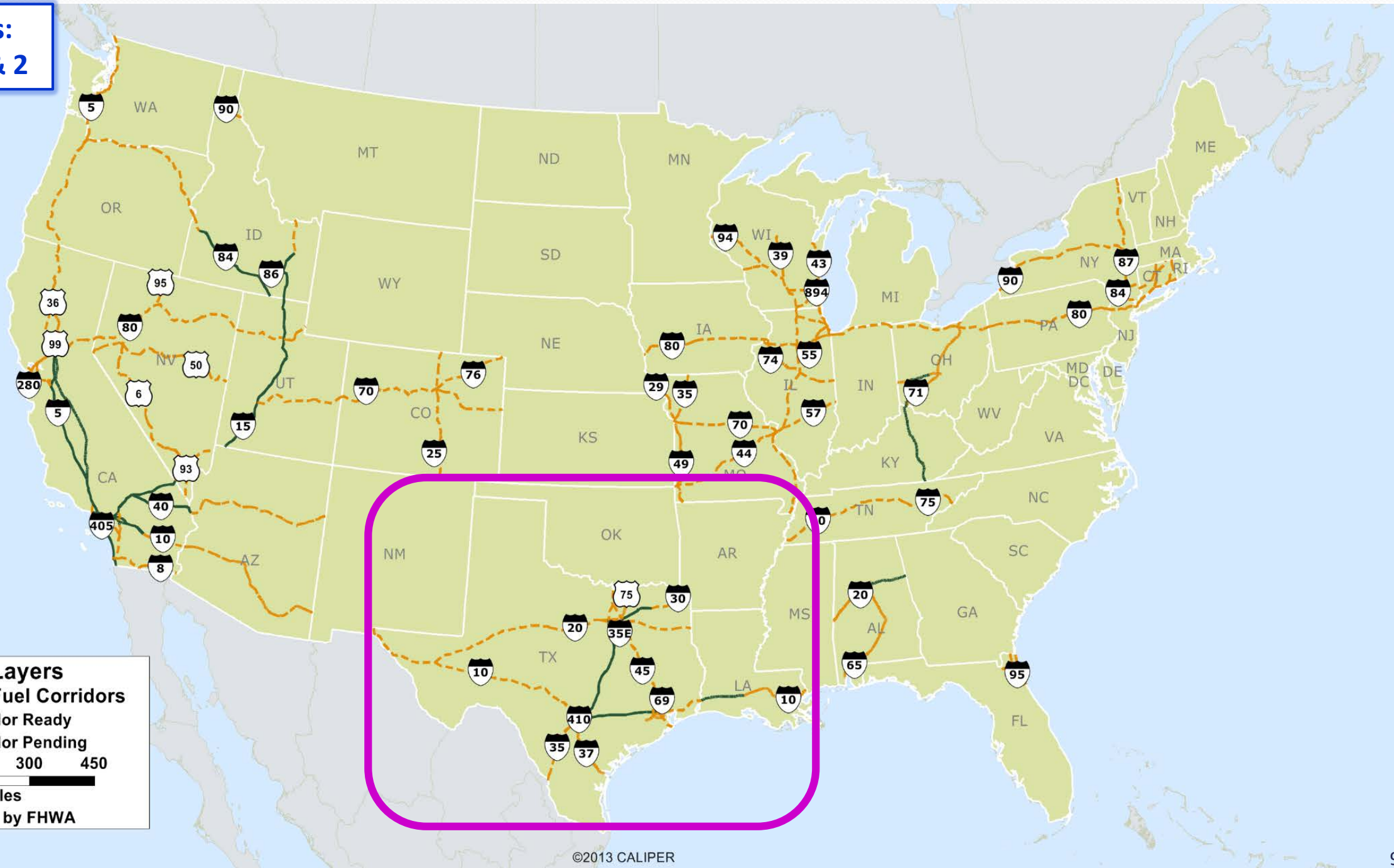
**LPG AFC's:
Rounds 1 & 2**



**LPG AFC's:
Rounds 1 & 2**





**LNG AFC's:
Rounds 1 & 2**



Map Layers

Alternative Fuel Corridors

-  LNG - Corridor Ready
-  LNG - Corridor Pending

0 150 300 450

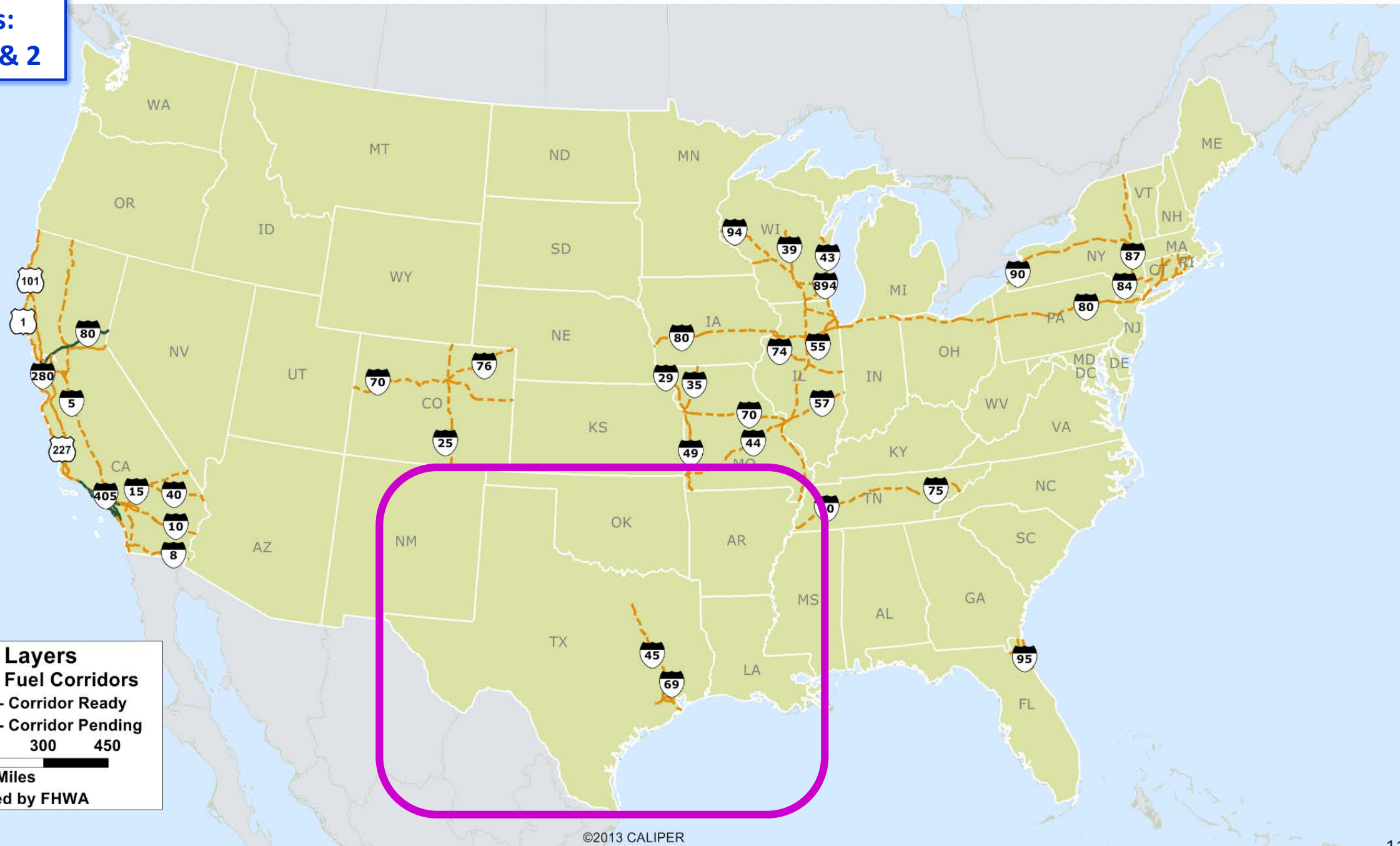
Miles

Prepared by FHWA

**LNG AFC's:
Rounds 1 & 2**



H₂ AFC's: Rounds 1 & 2



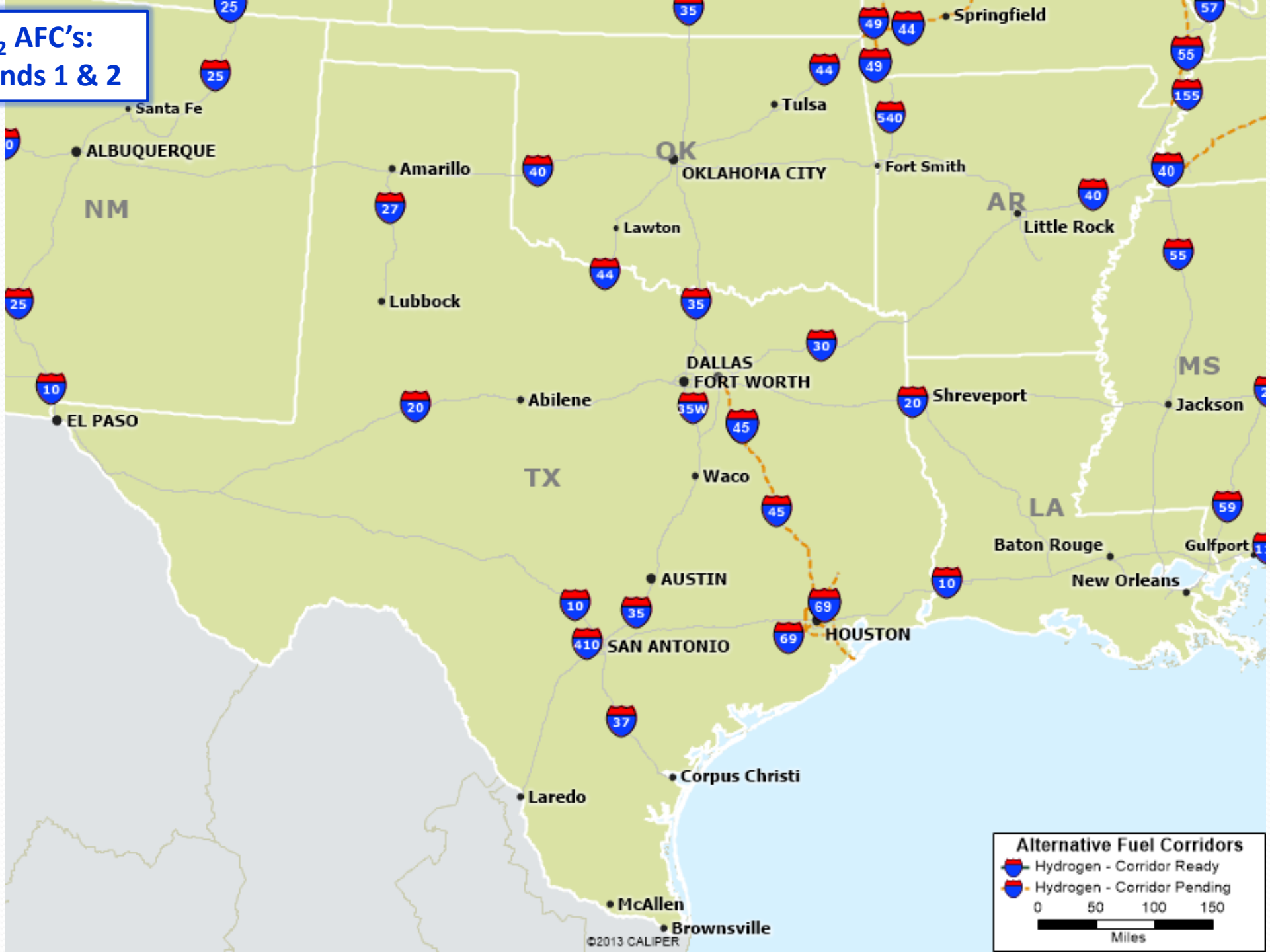
Map Layers
Alternative Fuel Corridors

- Hydrogen - Corridor Ready
- Hydrogen - Corridor Pending

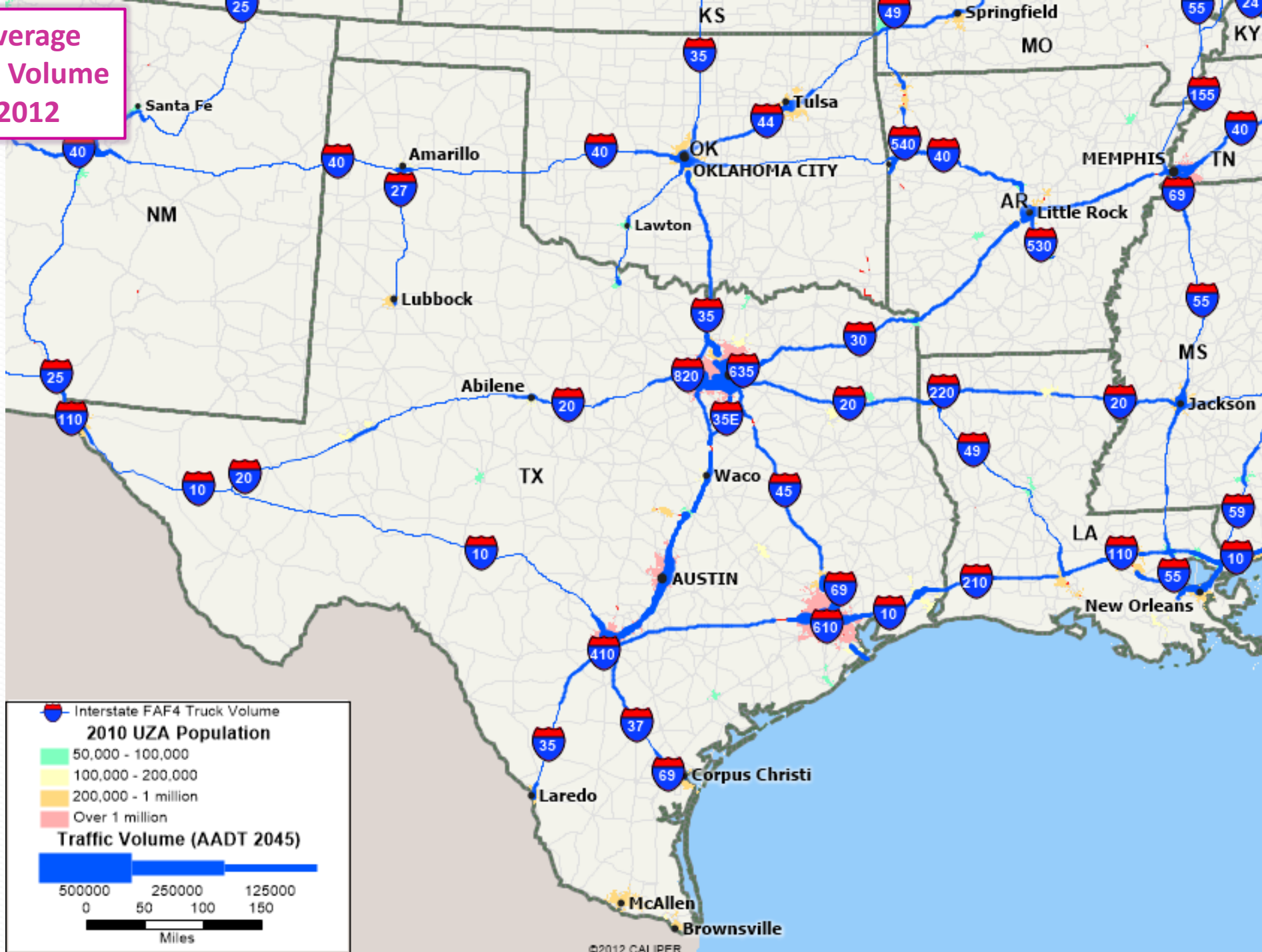
0 150 300 450
Miles

Prepared by FHWA

**H₂ AFC's:
Rounds 1 & 2**



**Annual Average
Daily Traffic Volume
(AADT) 2012**



**Annual Average
Daily Traffic Volume
(AADT) 2045**



Freight Trucking Flow, 2012



Freight Trucking Flow, 2045



Corridor Analysis for Annual Average Daily Traffic Volume

State	Hwy	Origin	Destination	AADT 2012	AADT 2045	Percent Increase
AR	I-40	AR/TN border	AR/OK border	37,595	156,123	315%
AR	I-49	Bella Vista	Alma	41,473	187,276	352%
OK	I-44	OK/MO border	Witchita Falls	45,430	86,153	90%
OK	US-75	OK/KS border	McAlester	20,298	42,966	112%
TX	I-10	TX/NM border	TX/LA border	84,954	199,387	135%
TX	I-35	TX/OK border	TX/Mexico border	100,567	219,745	119%
LA	I-20	LA/MS border	LA/TX border	53,470	109,747	105%
LA	I-12	Slidell	Baton Rouge	71,940	143,613	100%

Corridor Analysis for Long Distance Truck Volume

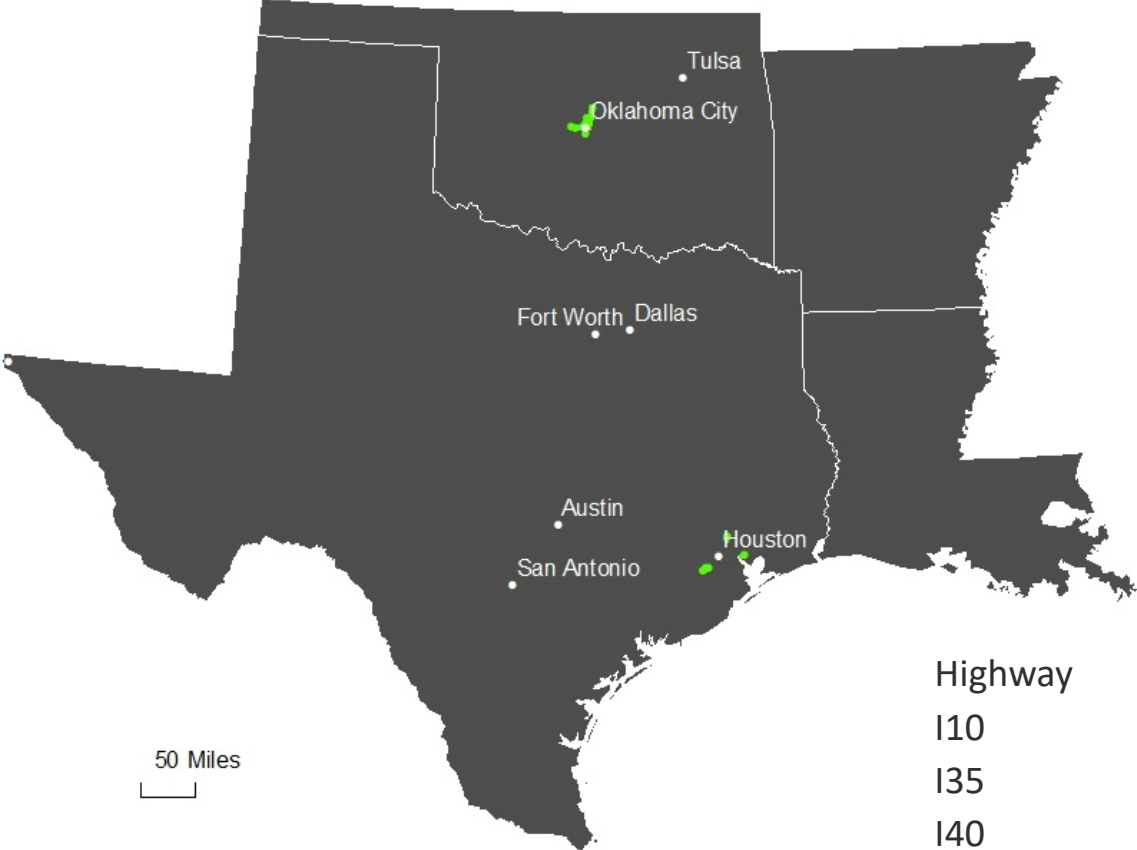
State	Hwy	Origin	Destination	AADT 2012	AADT 2045	Percent Increase
AR	I-30	North Little Rock	AR/TX border	7,637	15,543	104%
AR	I-55	AR/MO border	West Memphis	7,674	15,450	101%
OK	I-35	OK/KS border	OK/TX border	9,418	16,670	77%
OK	I-44	OK/MO border	Wichita Falls	4,827	9,083	88%
TX	I-10	TX/LA border	TX/NM border	7,230	14,931	107%
TX	I-45	Dallas	Galveston	4,539	8,247	82%
LA	I-10	LA/MS border	LA/TX border	6,557	13,059	99%
LA	I-12	Slidell	Baton Rouge	9,139	18,448	102%



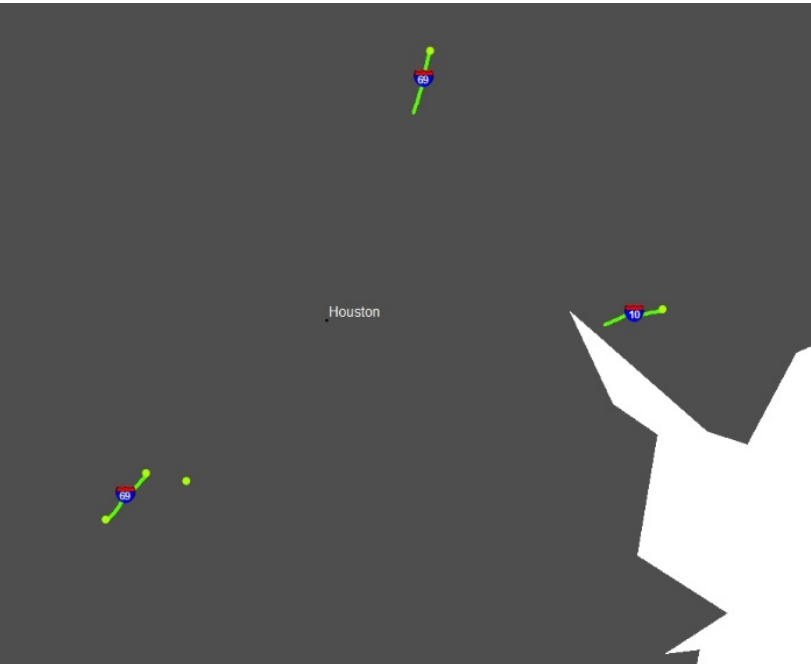
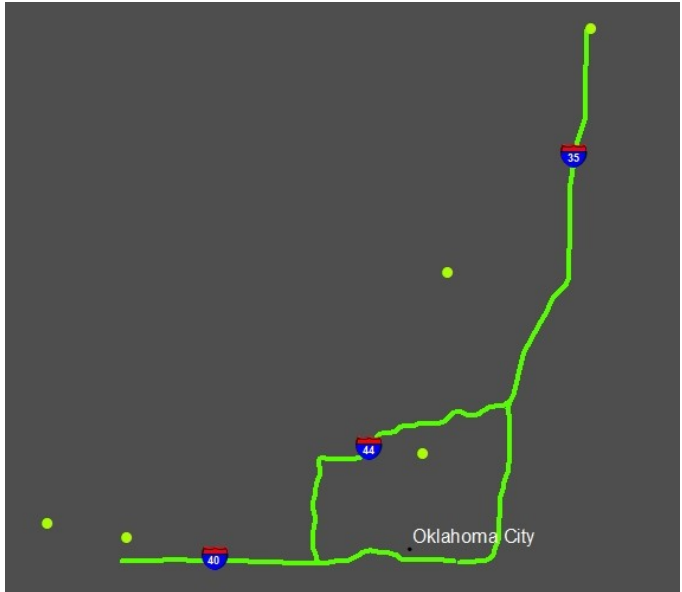
Round 1 and 2 Corridor Refresh

Corridors designated as pending in Rounds 1 and 2 were reevaluated to determine if criteria were met for ready status.

New Ready Electric Corridors

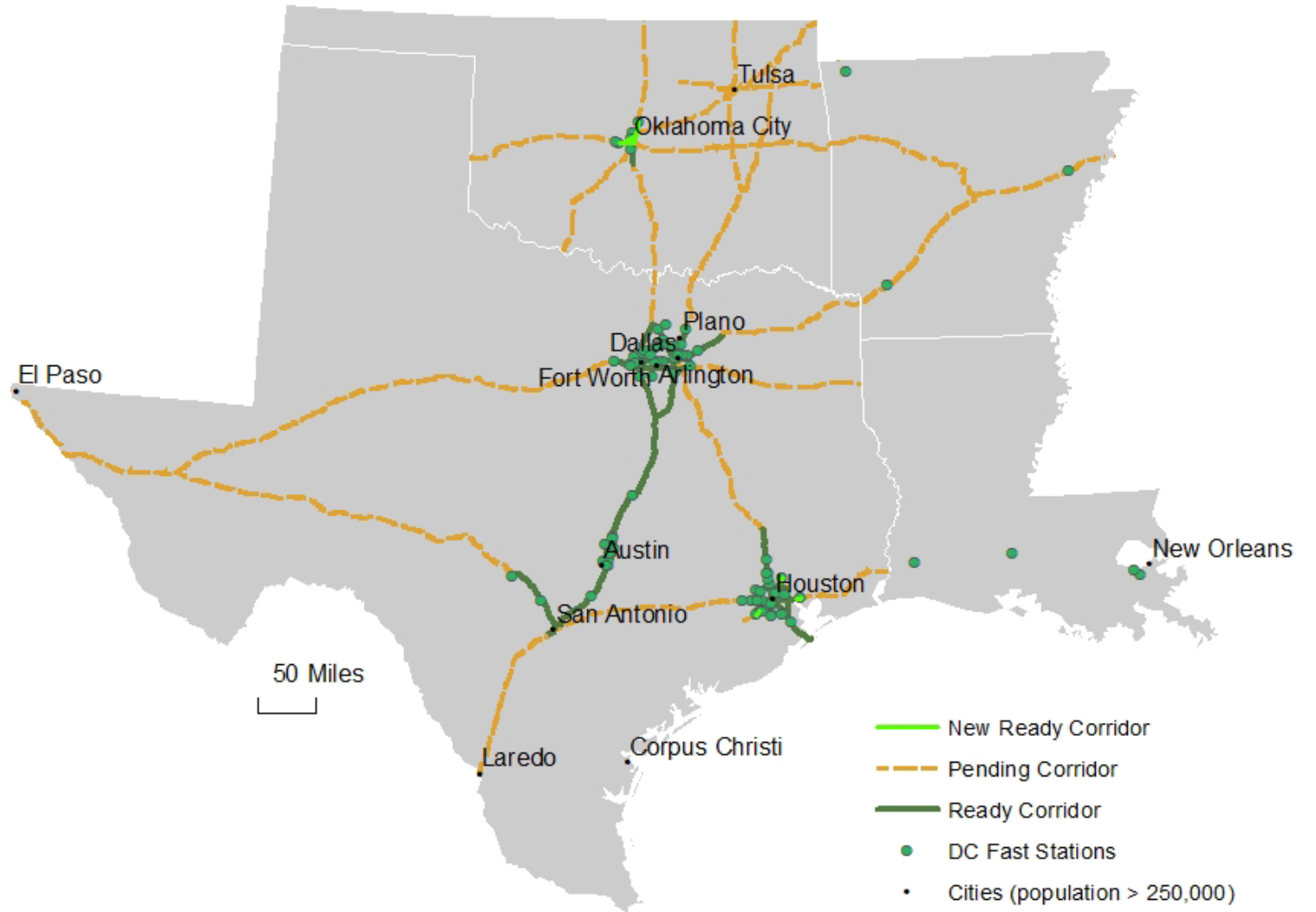


Highway	Miles
I10	4
I35	20
I40	12
I44	11
I69	9

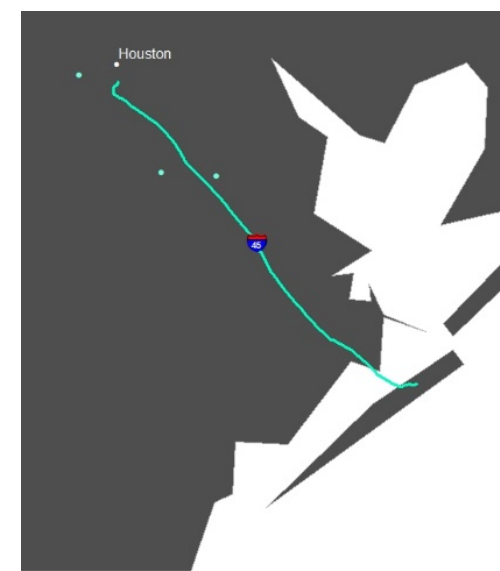
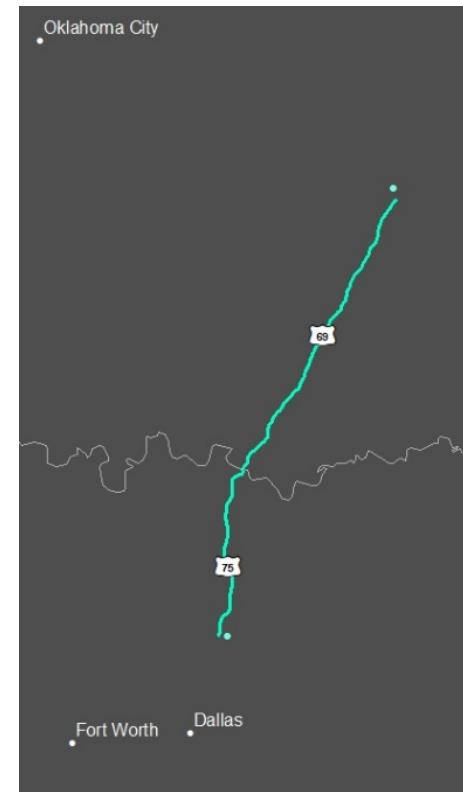
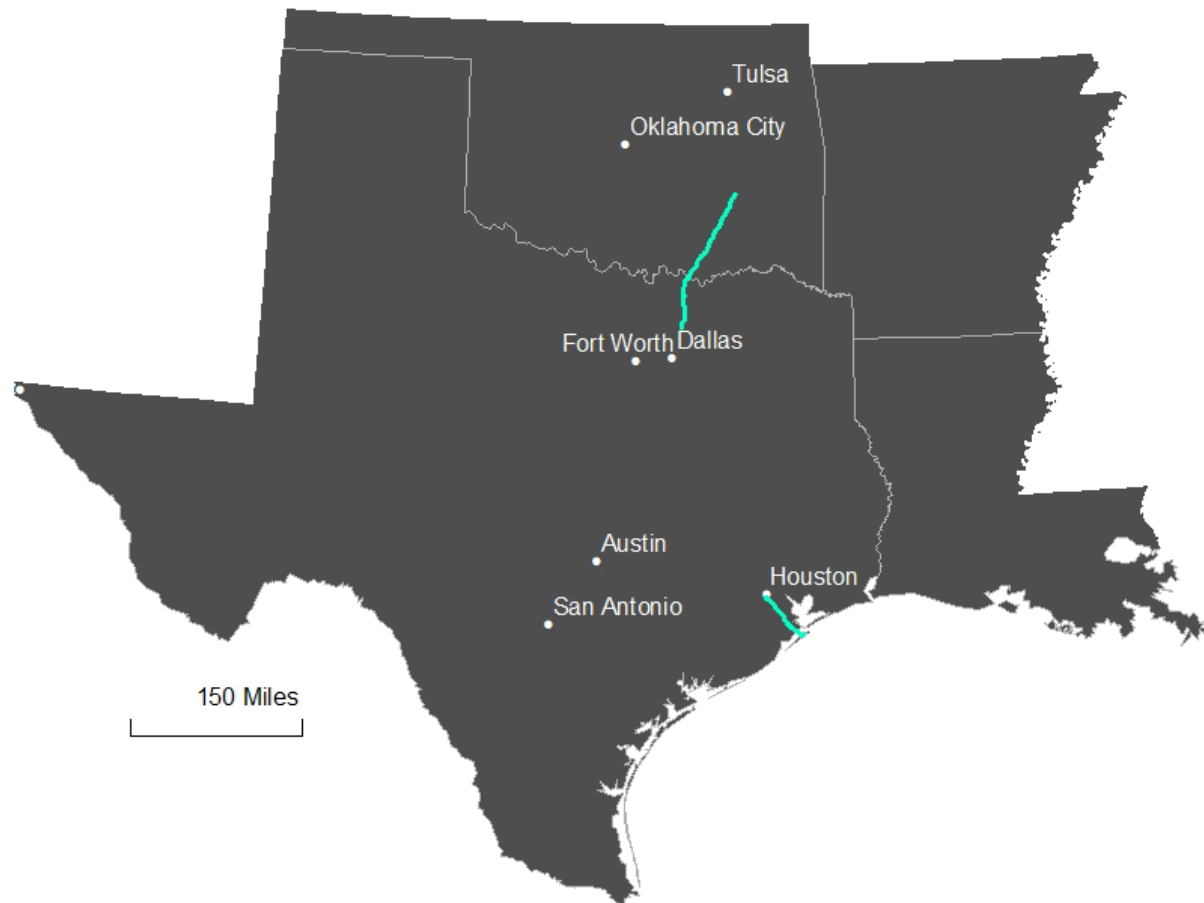


Round 1 and 2 electric corridor refresh

55 miles of new corridors
on five highways

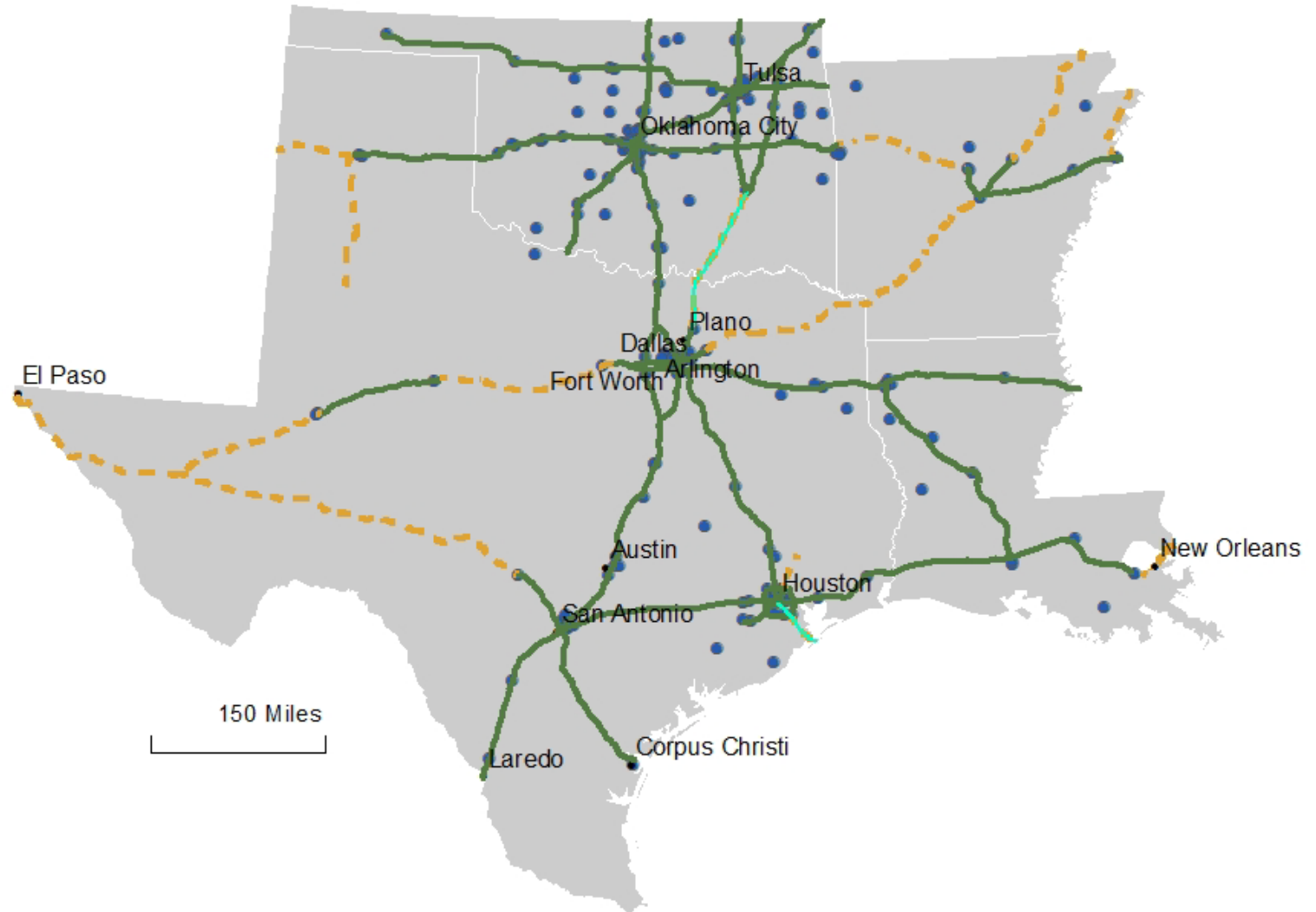


New Ready CNG Corridors



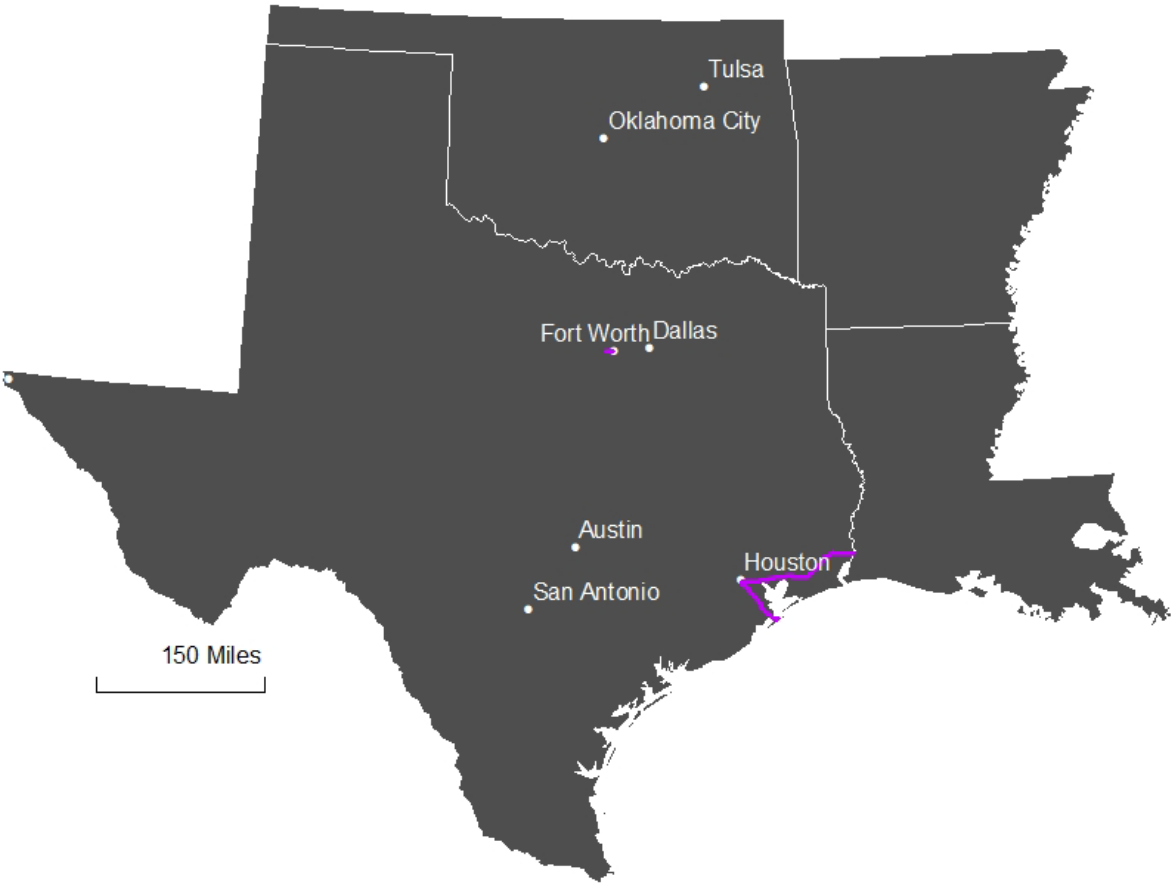
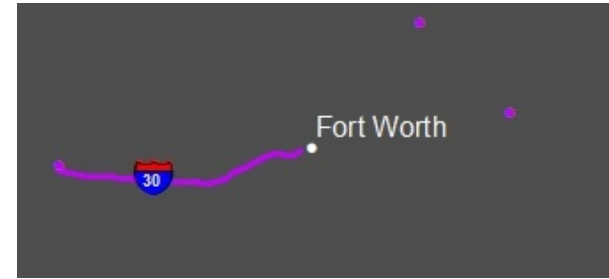
Highway	Miles
I45	49
U69	85
U75	49

Round 1 and 2 CNG corridor refresh



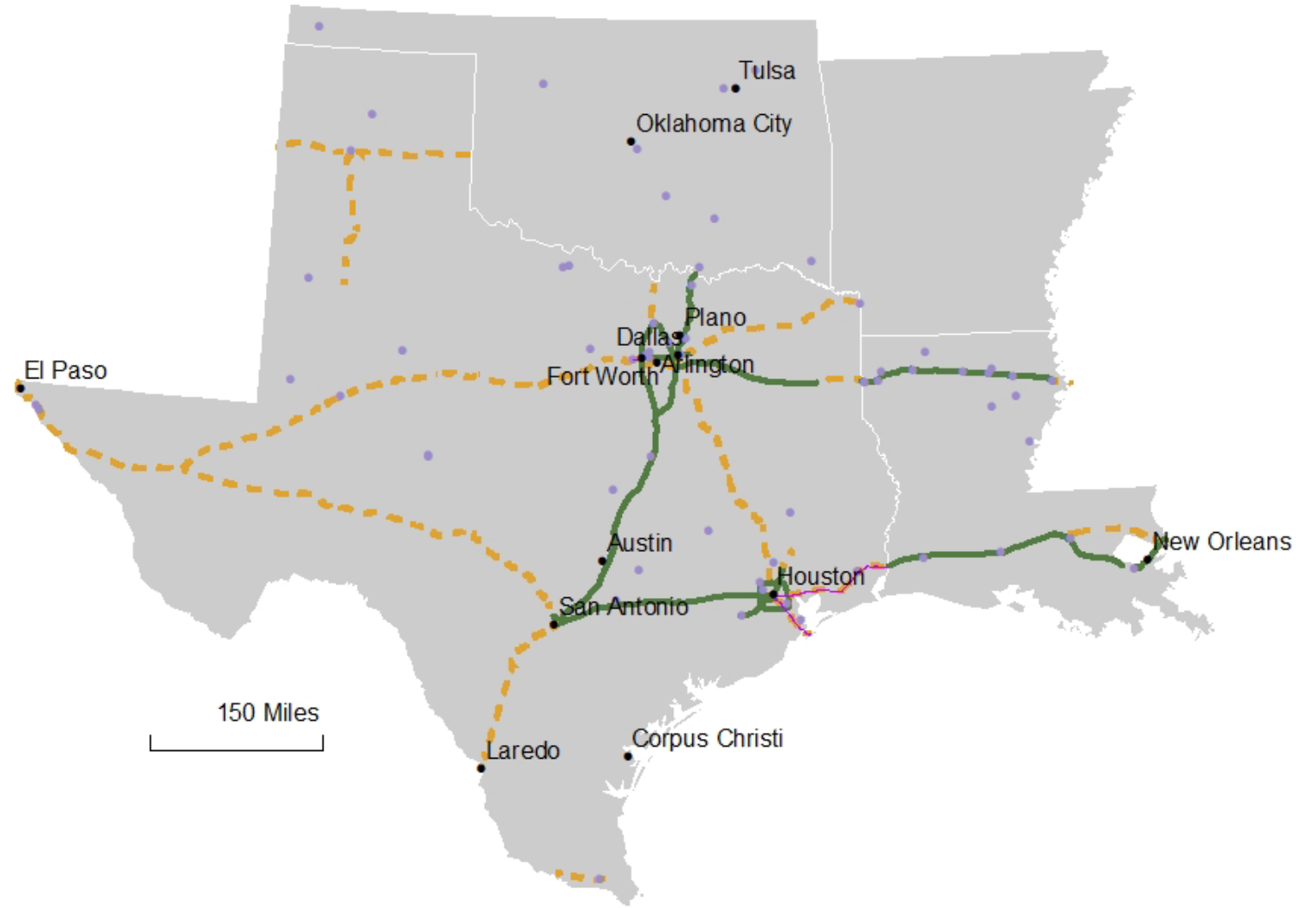
183 miles of new corridors
on three highways

New Ready Propane Corridors



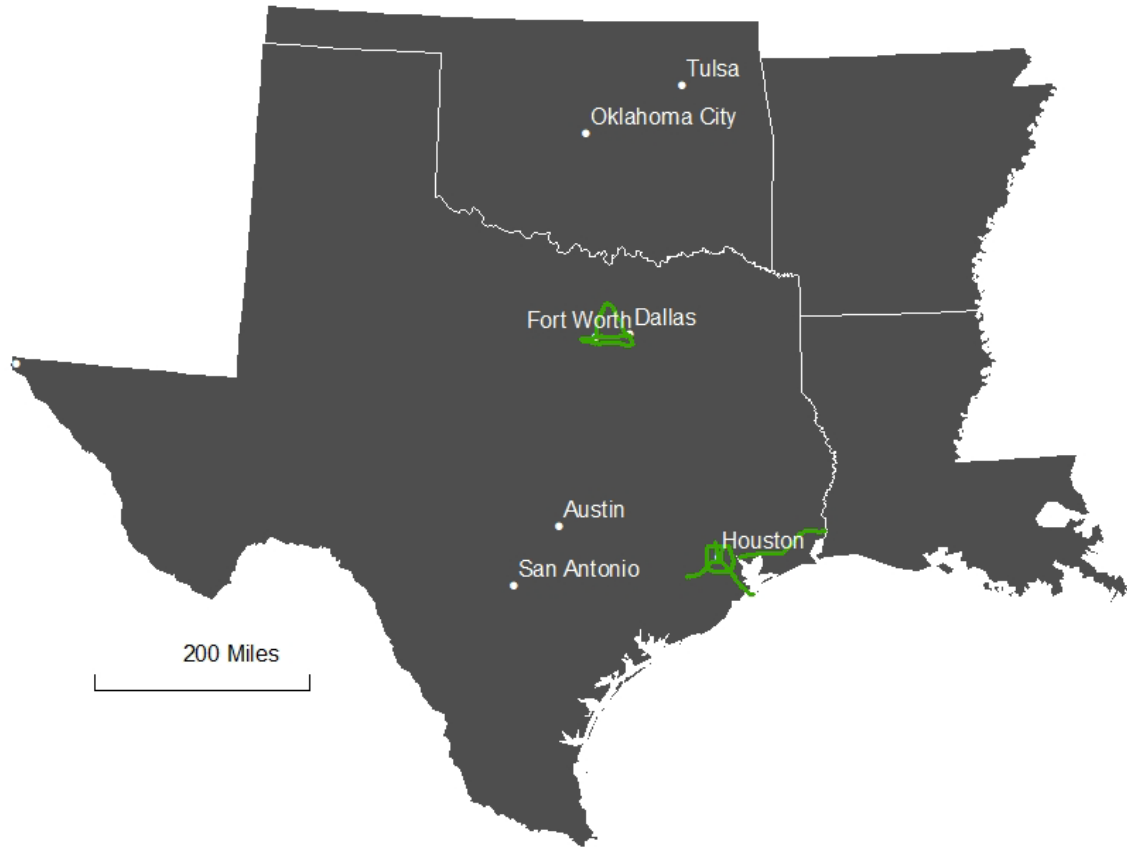
Highway	Miles
I10	112
I30	7
I45	49

Round 1 and 2 Propane corridor refresh

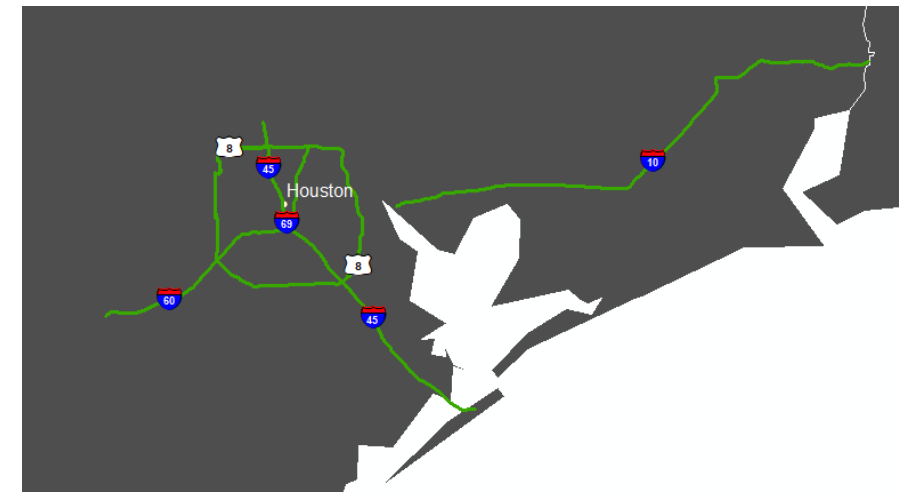


168 miles of new corridors
on three highways

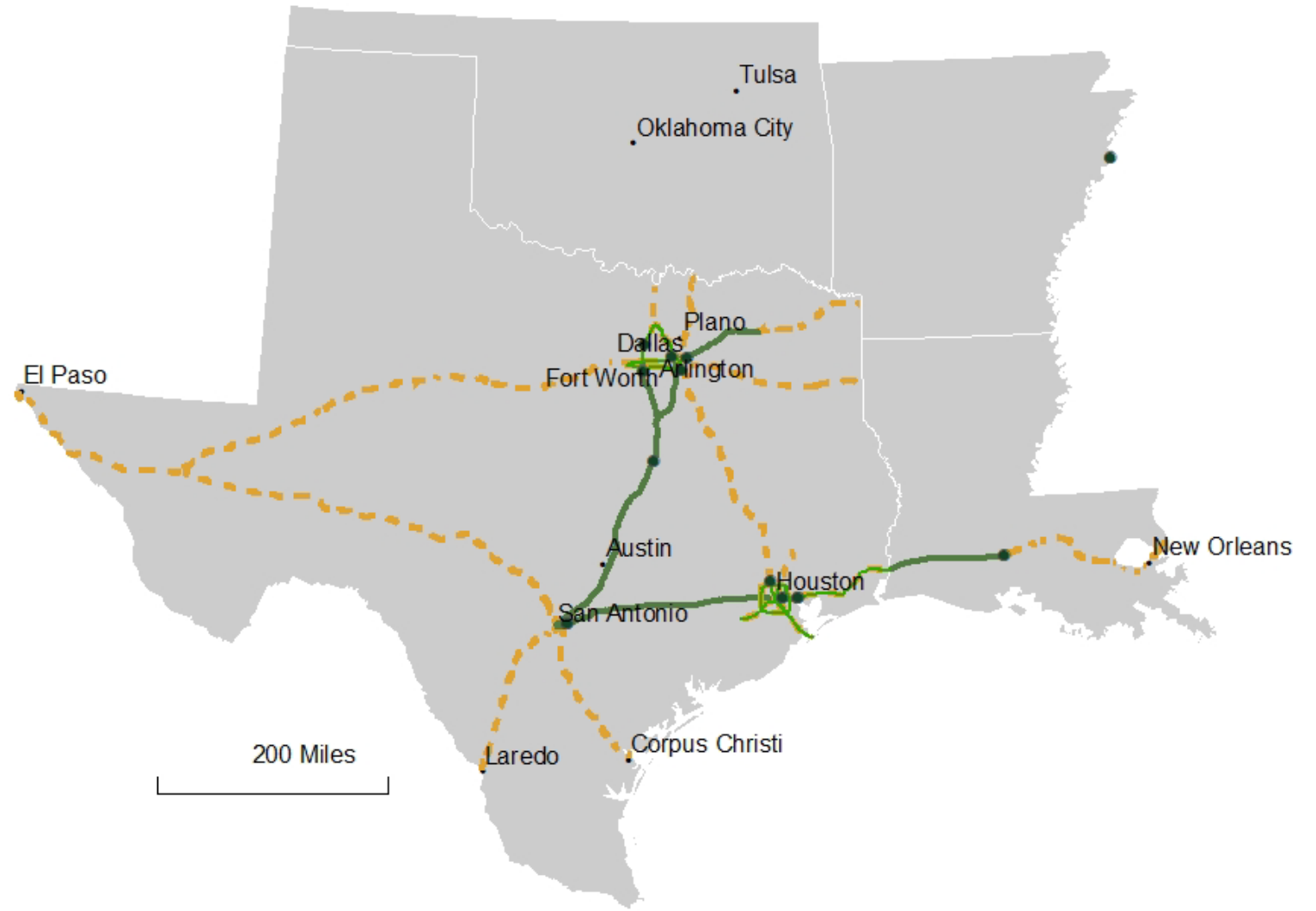
New Ready LNG Corridors



Highway	Miles
I10	95
I20	51
I30	47
I35E	40
I35W	35
I405	73
I45	74
I69	51
S8	115



Round 1 and 2 LNG corridor refresh



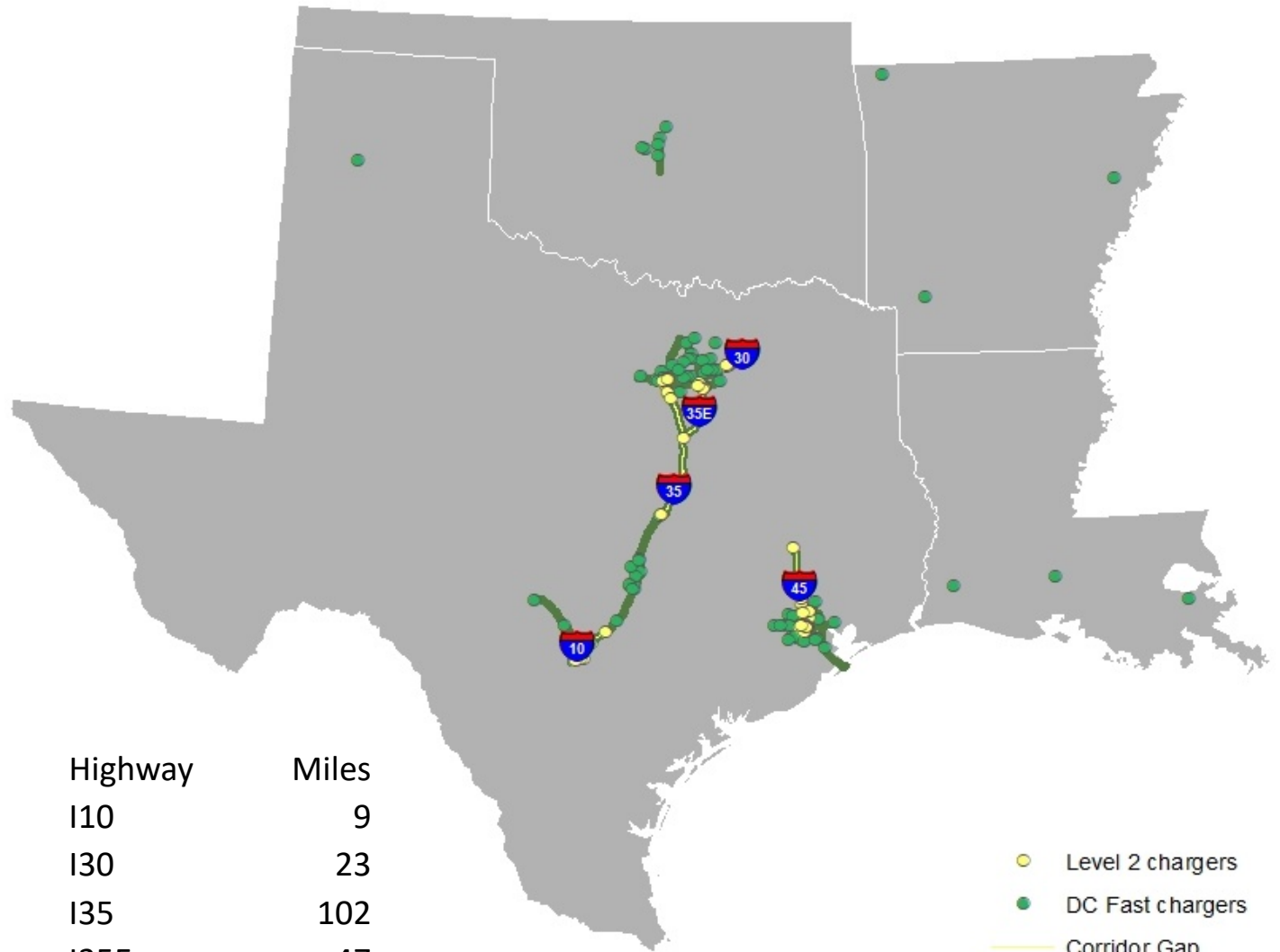
580 miles of new corridors
on nine highways



Round 1 Electric Corridor Resiliency Analysis Evaluation

Round 1 electric corridor evaluation

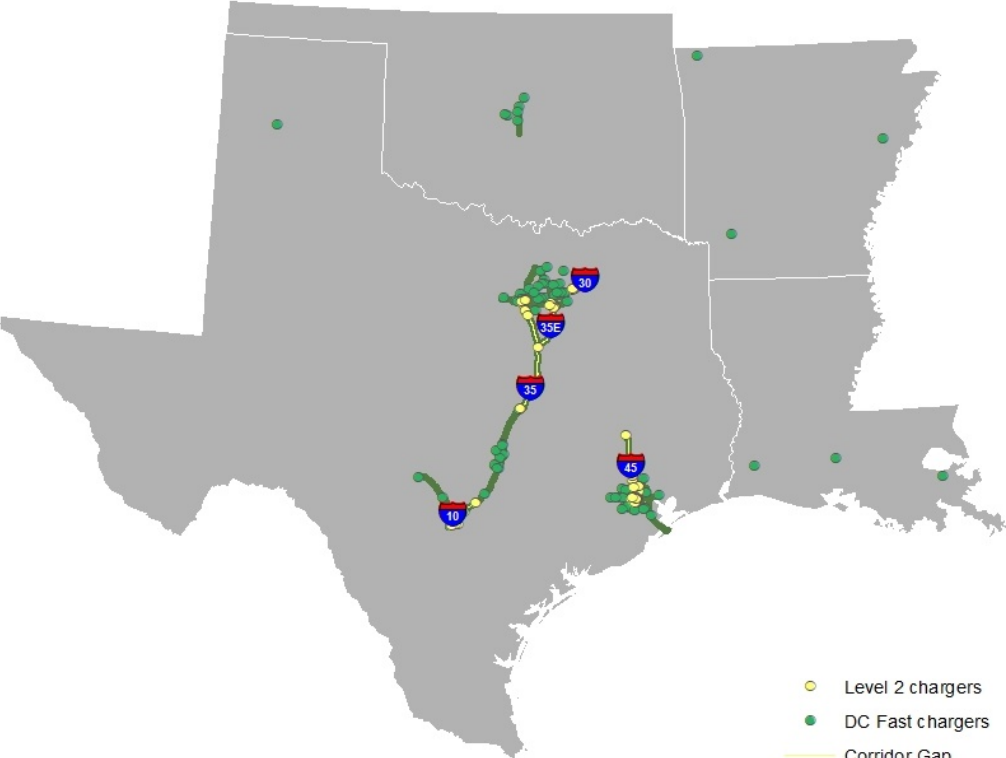
Three highway regions were awarded corridor status in Round 1 – covering 290 miles – with Level 2 chargers, but need additional DC Fast installations for continued designation



Highway	Miles
I10	9
I30	23
I35	102
I35E	47
I35W	45
I45	63

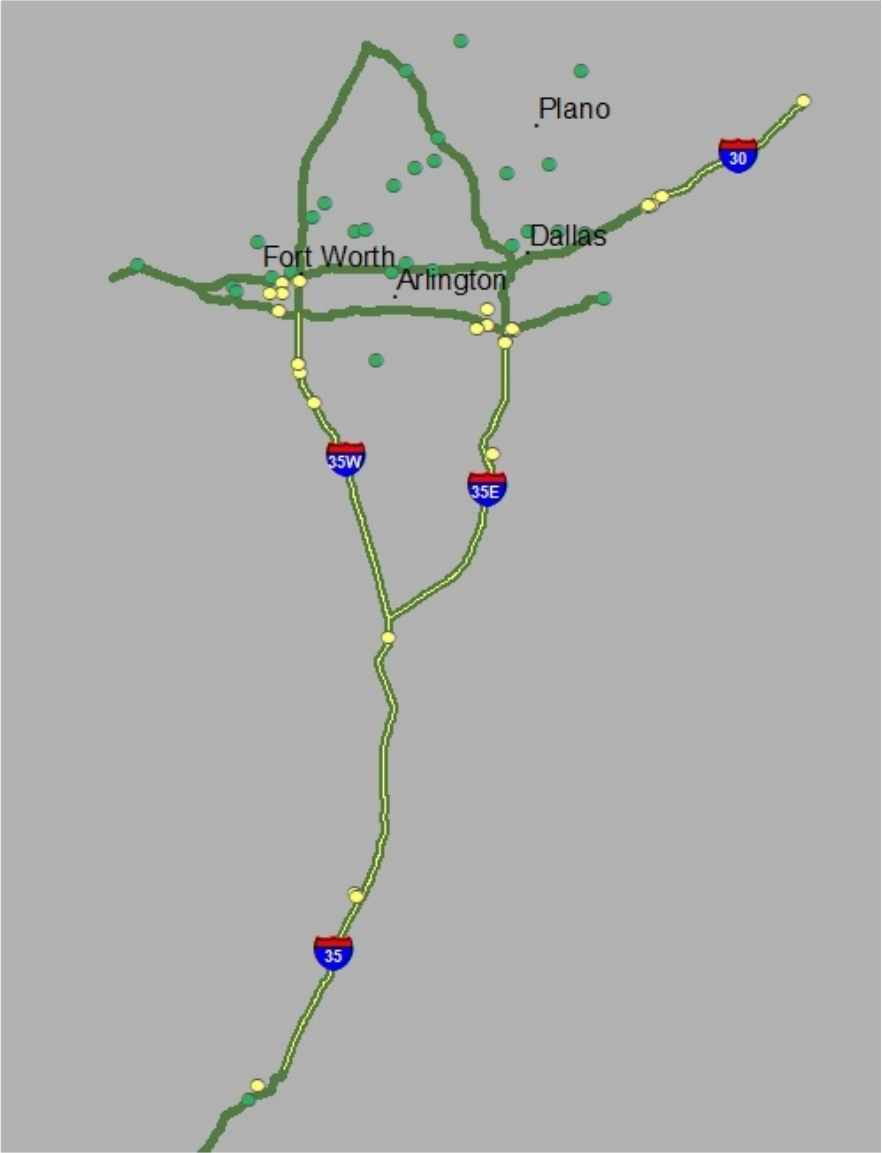
- Level 2 chargers
- DC Fast chargers
- Corridor Gap
- Ready Corridor

Dallas/Fort Worth

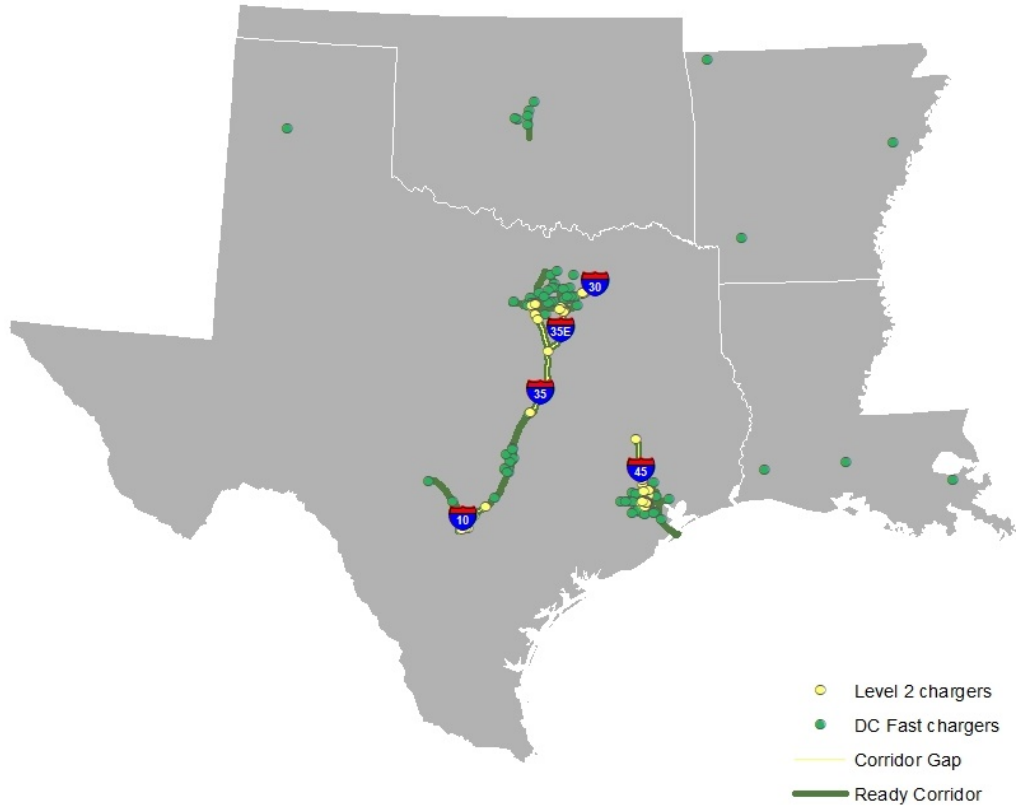


- Level 2 chargers
- DC Fast chargers
- Corridor Gap
- Ready Corridor

Highway	Miles
I30	23
I35	68
I35E	47
I35W	30

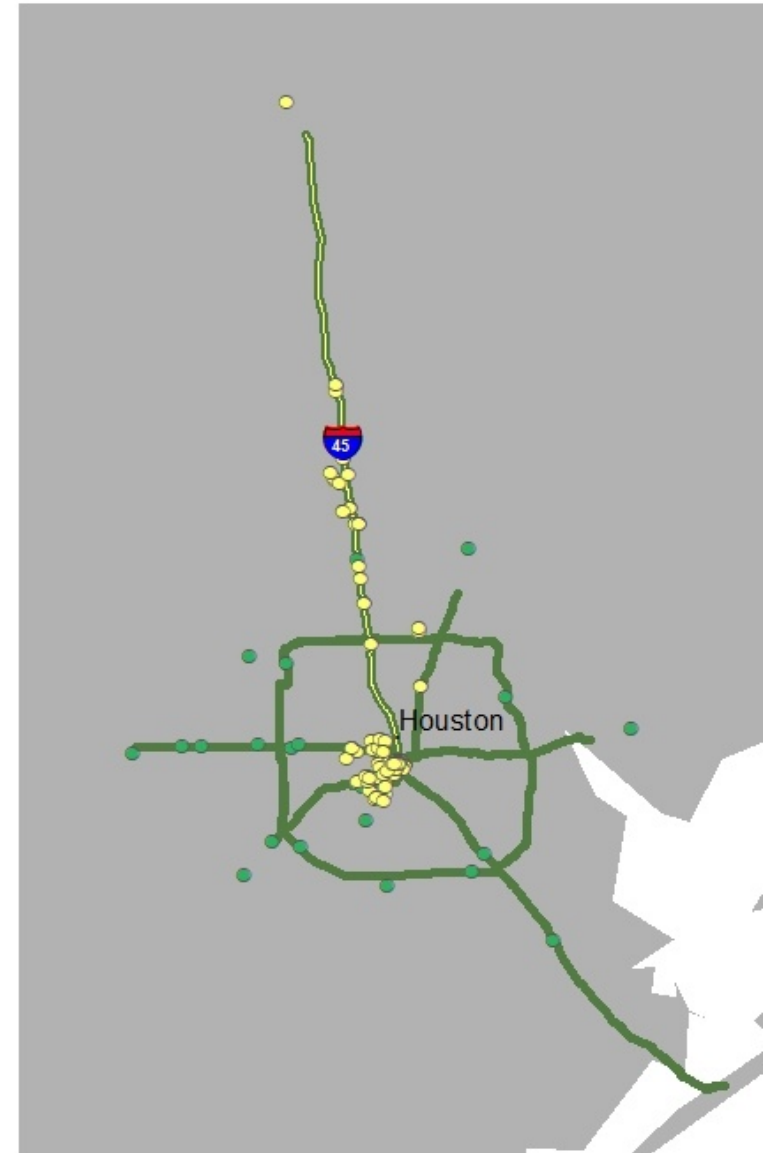


Houston

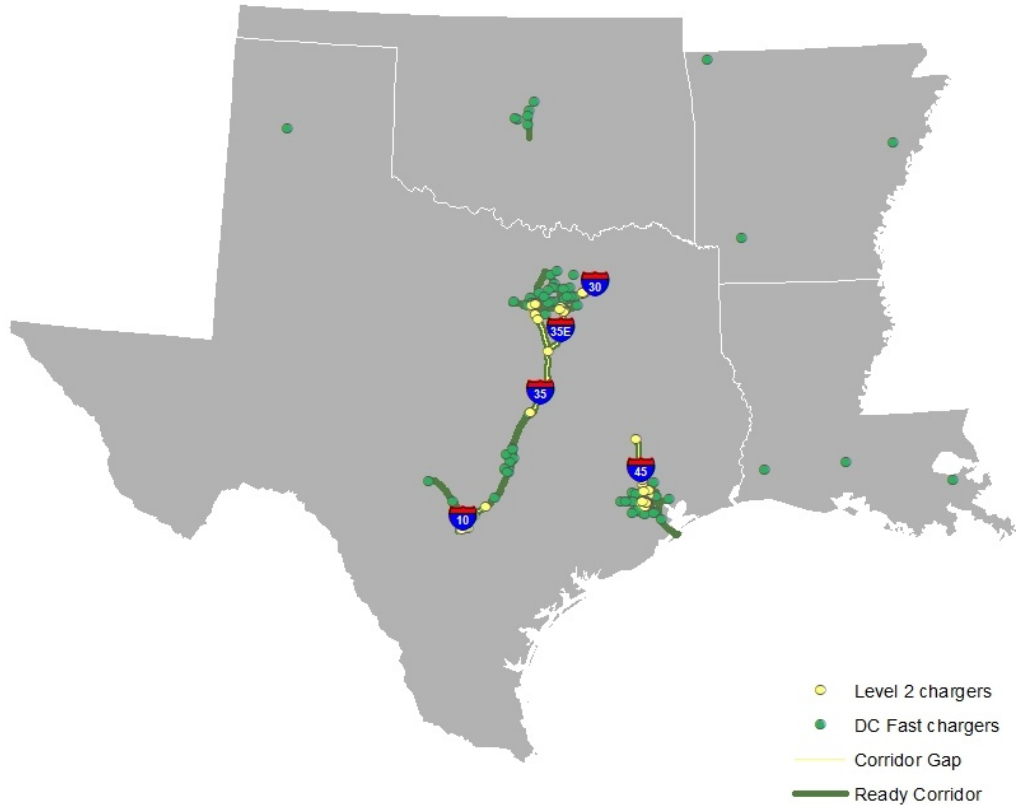


Highway
I45

Miles
63



San Antonio

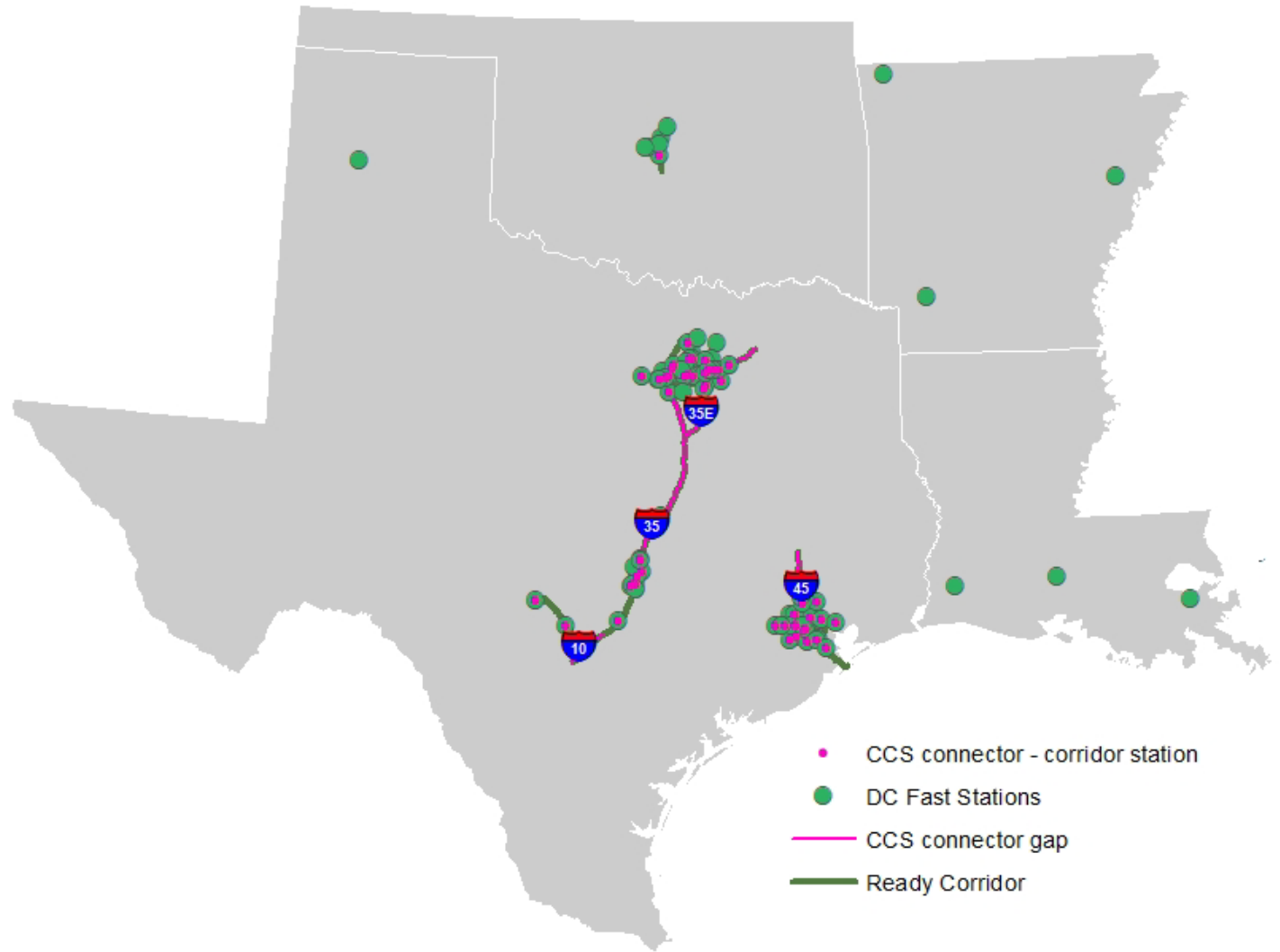




Future Electric Corridor Considerations

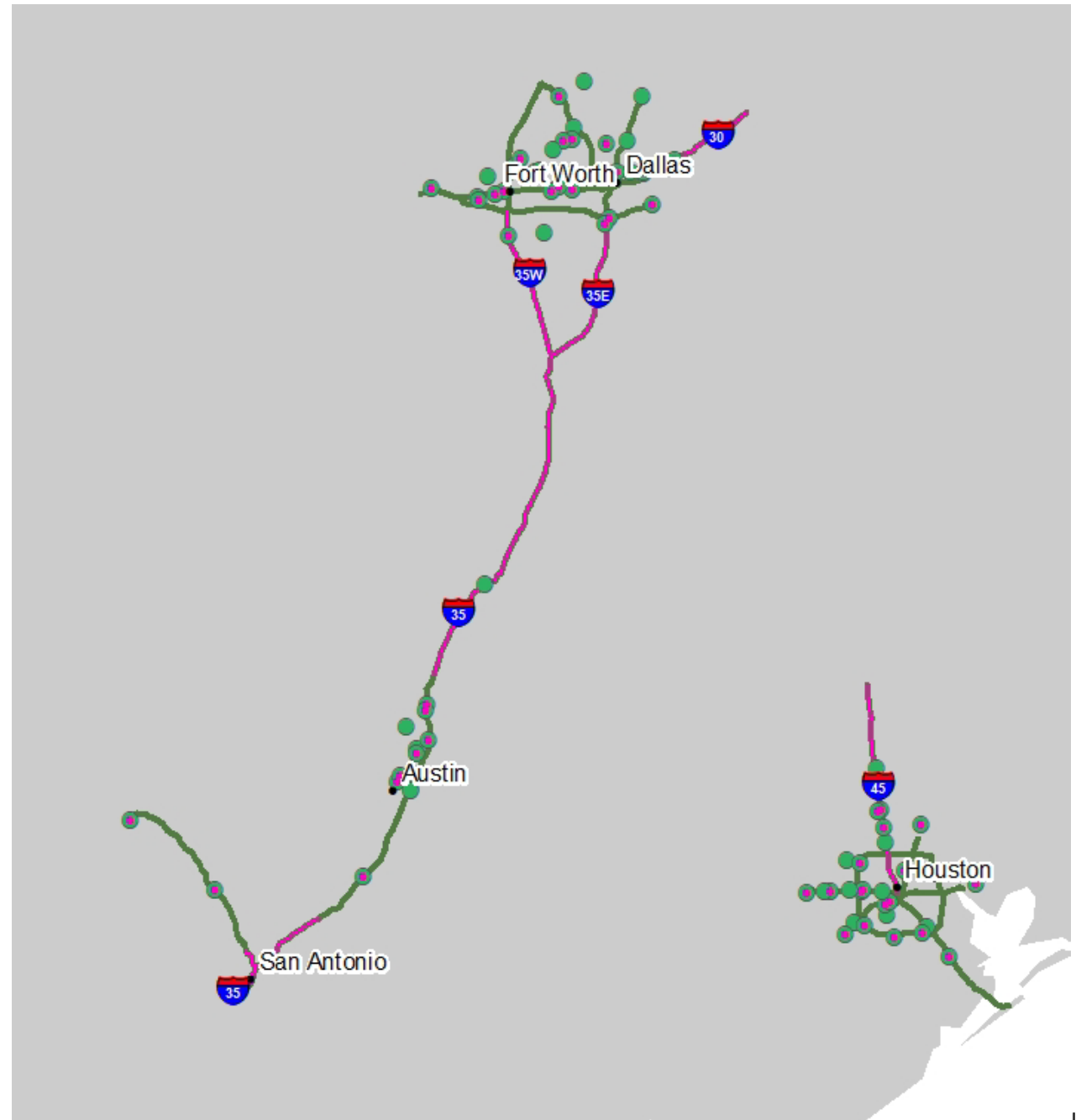
DC Fast Charger Types

Electric vehicles charge using a specific connector. A CCS connector vehicle would have 328 miles of gaps in charging along designated corridors.



DC Fast Charger Types

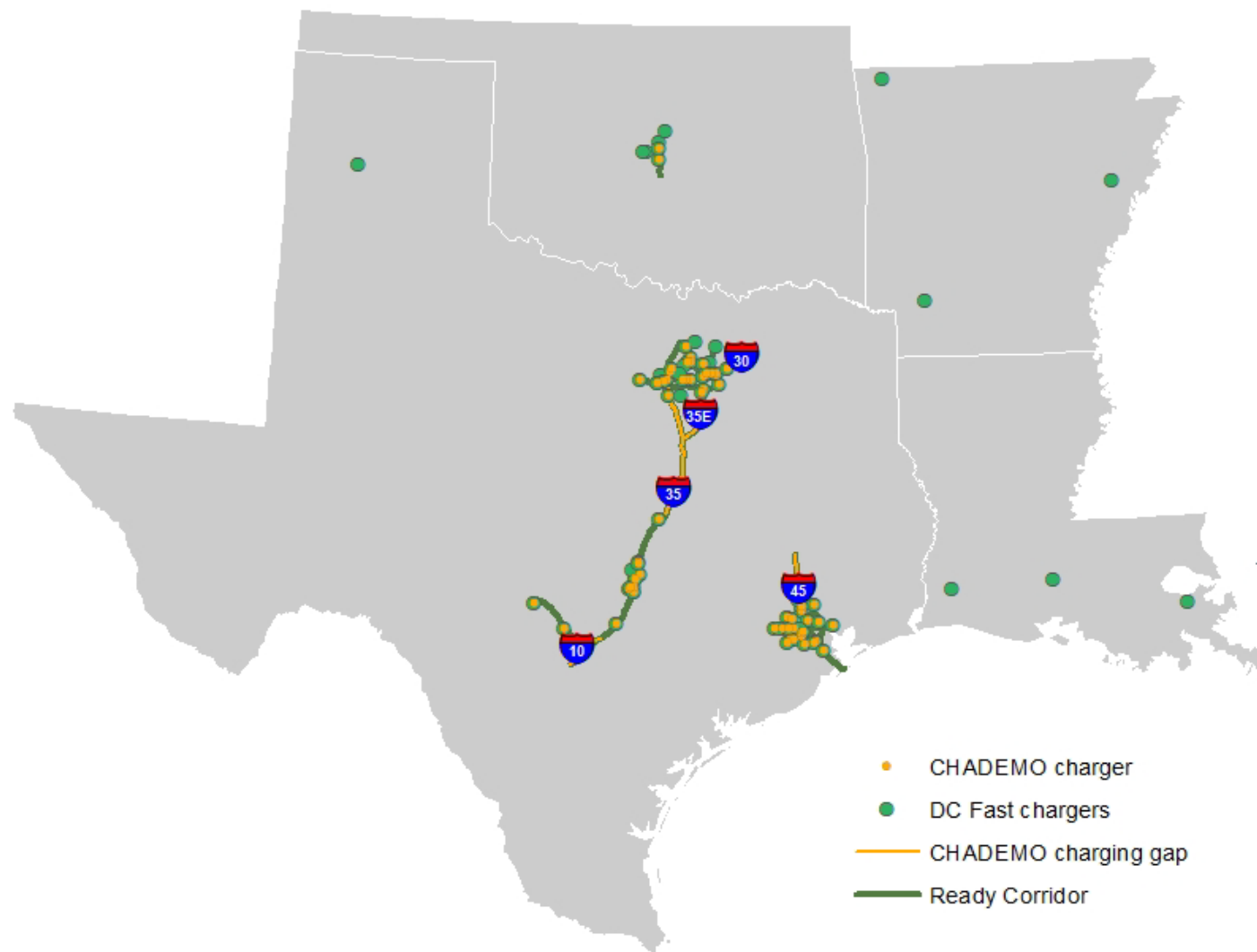
The longest CCS connector gap is between Austin and Dallas/Ft Worth with other gaps outside of Dallas, San Antonio, and Houston.



DC Fast Charger Types

A CHADEMO connector vehicle would have 290 miles of gaps in charging along designated corridors.

Interestingly, these CHADEMO gaps are the same as the L2 gaps, which indicates connector should be considered when upgrading L2 chargers.

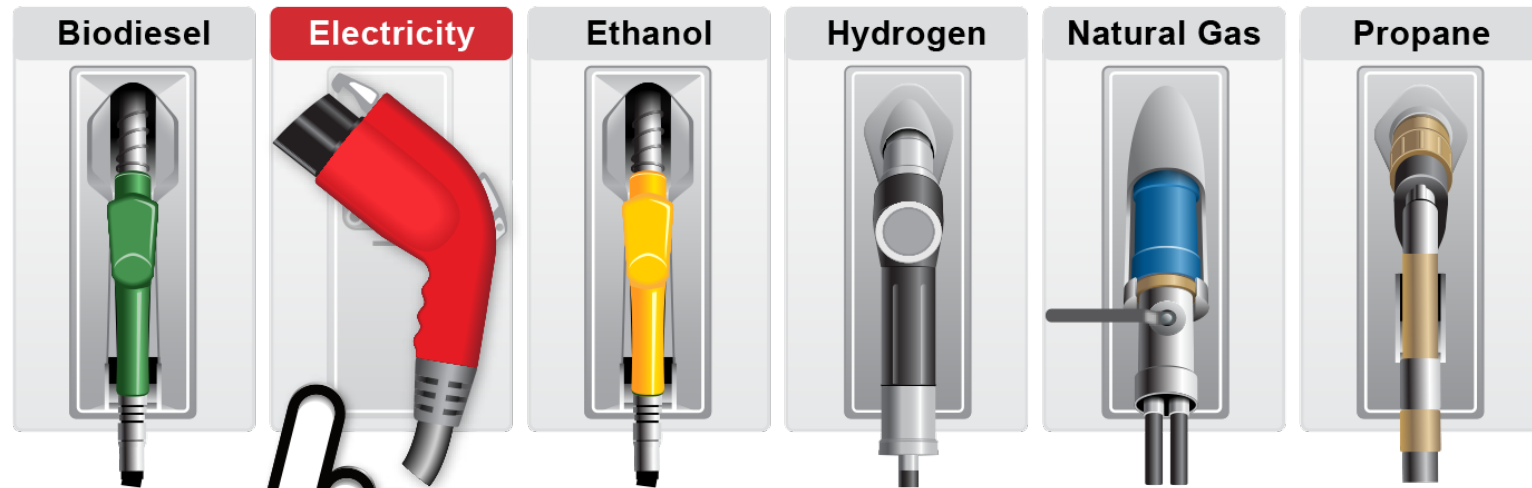




Alternative Fuels Data Center Station Locator and Corridor Tools

Steve Lommele and Johanna Levene
April 9, 2019

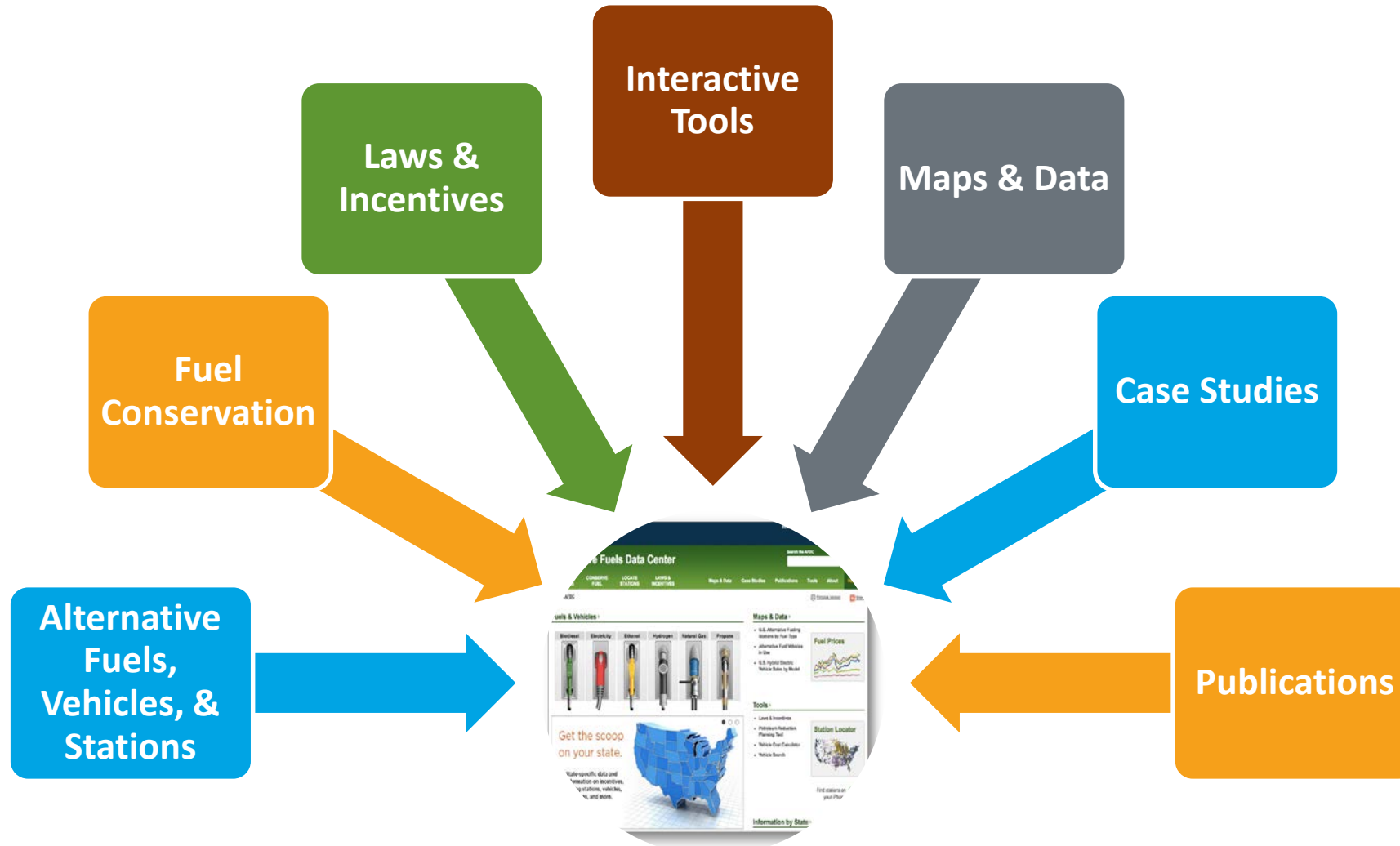
Alternative Fuels Data Center



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

afdc.energy.gov

What does the AFDC provide?



Alternative Fuel Stations

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Alternative Fuels Data Center

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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](#).

29,060 results in

Legend

- Biodiesel
- CNG
- Electric
- Ethanol
- Hydrogen
- LNG
- Propane

Powered by Esri | Esri, HERE, Garmin, NGA, USGS

[iPhone App for U.S. stations](#) [Android App for U.S. stations](#) [Developer APIs](#) [Embed Tool](#) [Submit New Station](#) [About the Data](#)

<http://afdc.energy.gov/stations>

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** 2,576 results in U.S. and Canada

Enter location Electric Level 1 Level 2 DC Fast Charging CHAdeMO CCS Tesla

Los Ranchos de Albuquerque
NEW MEXICO
OKLAHOMA
ARKANSAS
MISSISSIPPI
ALABAMA
TEXAS
LOUISIANA
TENNESSEE
Gulf of Mexico

© MapTiler © OpenStreetMap contributors

Alternative Fuel Stations

The screenshot shows the 'Alternative Fuels Data Center' website. The navigation menu at the top includes 'FUELS & VEHICLES', 'CONSERVE FUEL', 'LOCATE STATIONS', 'LAWS & INCENTIVES', 'Maps & Data', 'Case Studies', 'Publications', 'Tools', 'About', and 'Home'. The 'LOCATE STATIONS' menu is open, showing options like 'Search by Location', 'Map a Route', and 'Station Data by State'. A red box highlights the 'Download Station Data' button. Below the menu, there's a search bar with 'Public Stations' and a location input field containing 'Electric'. There are also filters for 'Level 1', 'Level 2', and 'DC Fast Charging' (with sub-options for CHAdeMO, CCS, and Tesla). The main content area shows a map of the southern United States (Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky) with numerous green dots representing fuel stations. A search result summary shows '2,576 results in U.S. and Canada'. A 'Printable Version' and 'Share' button are also visible.

Alternative Fuels Data Center

EERE » AFDC » Tools

Data Downloads

To download data related to alternative fuels and advanced vehicles, follow the steps below.

Step 1. Choose data to download

Choose the dataset and file format you want to download.

Dataset: Alternative fuel stations

File Format: CSV (opens in Excel)

Read descriptions of the [data included in the alternative fuel stations download](#).

Data updated monthly. Last updated: 12/07/2018

Just looking for the closest alternative fuel station?
Use our [Alternative Fueling Station Locator](#) to find nearby stations.

Download Options

Fuel type: Compressed Natural Gas

Access: Public

Status: Open

Step 2. Share your information

Provide the following contact and use information to download the data.

First Name: Johanna

Last Name: Levene

E-mail Address: johanna.levene@nrel.gov

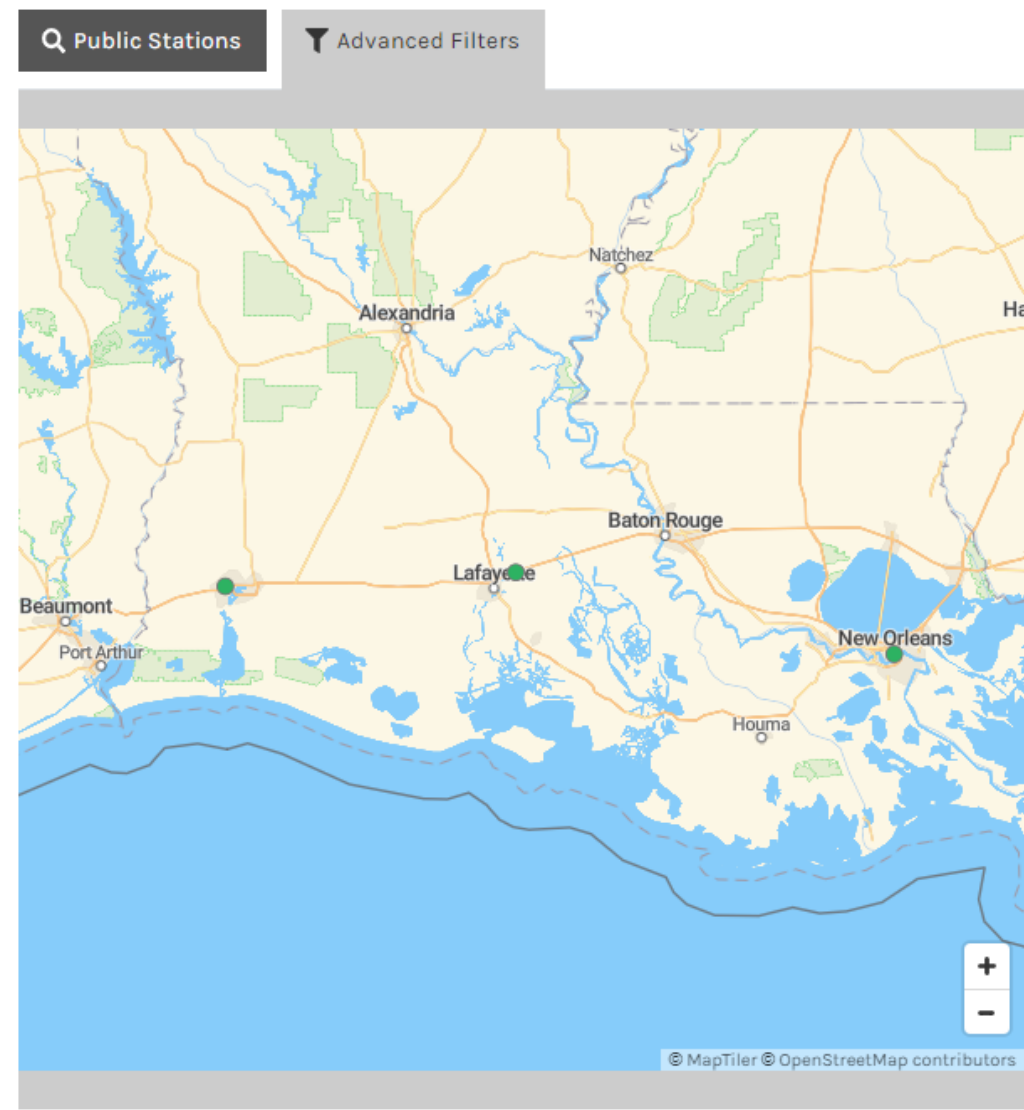
How will you use the data? (optional): Corridor designation

* Required fields

I have read and agree to the [terms and conditions](#).

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](#).



Edit Filters

3
stations

11
charging outlets

Filters chosen:

- Louisiana
- Electric**
Types: DC Fast
Connectors/outlets:
CHAdEMO, SAE CCS
- Access: Public**

Download Results

Alternative Fuel Stations

Public Stations | Advanced Filters | U.S. and Canada

Enter location | All Fuels | Map a Route

Submit New Station

Use this form to suggest adding a station.

* Required field

Your Contact Information

* First Name * Last Name

* Email * Phone

Station Information

* Available Fuel(s)

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

Legend: Biodiesel, CNG, Electric, Ethanol, Hydrogen, LNG, Propane

[iPhone App for U.S. stations](#)
[Android App for U.S. stations](#)
[Developer APIs](#)
[Embed Tool](#)
[Submit New Station](#)
[About the Data](#)

Goals for the Mapping Tools



Ease Nomination
of Alternative
Fuel Corridors



Plan Fueling
Infrastructure
Development

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, 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 Sept. 5, 2018, 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](#)

- CSV downloads
- Shapefiles
- Interactive maps

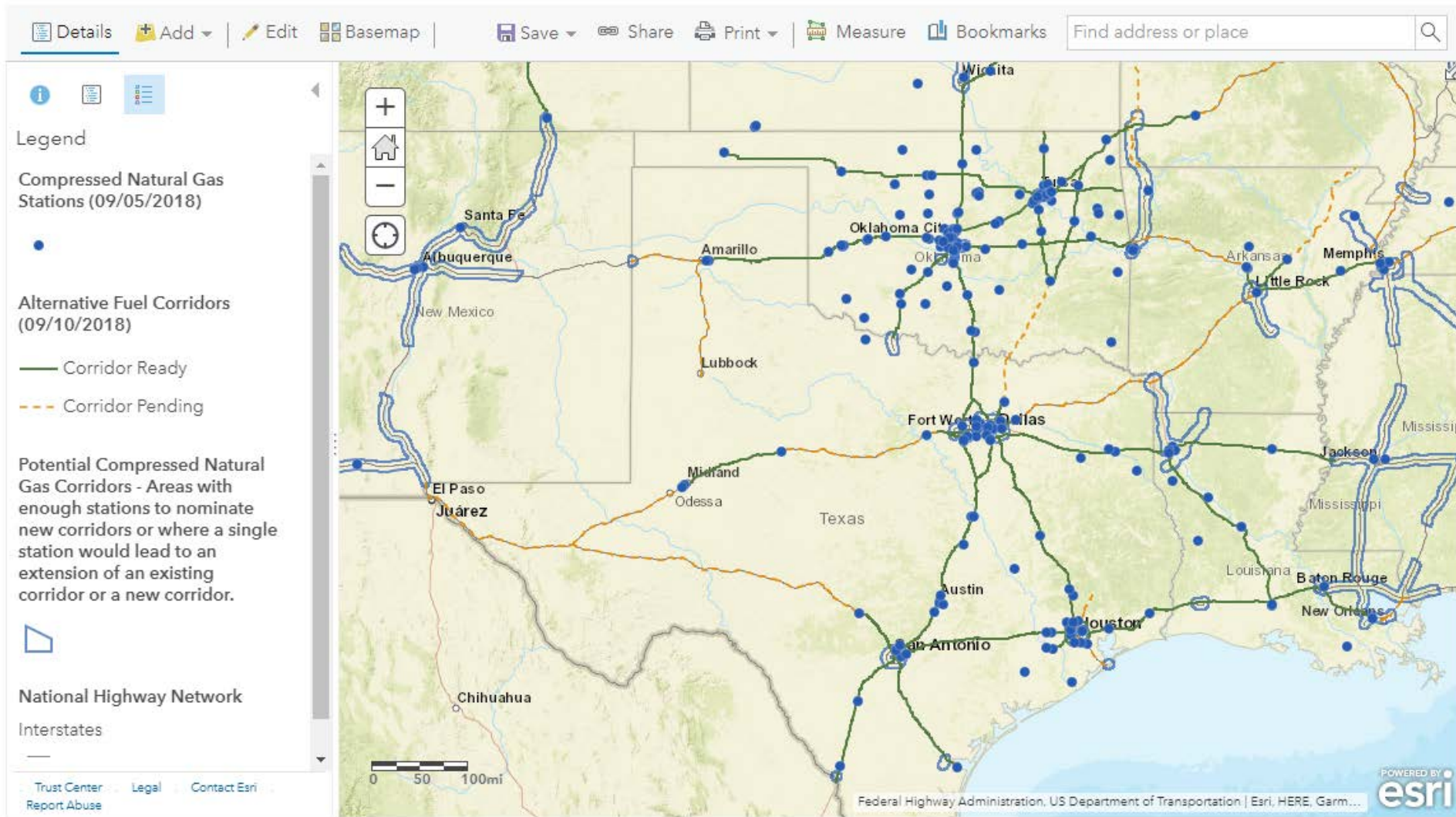
afdc.energy.gov/corridors

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
Colorado	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile
Connecticut	 data shapefile	 data shapefile	 data shapefile	 data shapefile	 data shapefile

Interactive Maps

ArcGIS ▼ Compressed Natural Gas (CNG) Corridor Map ✎

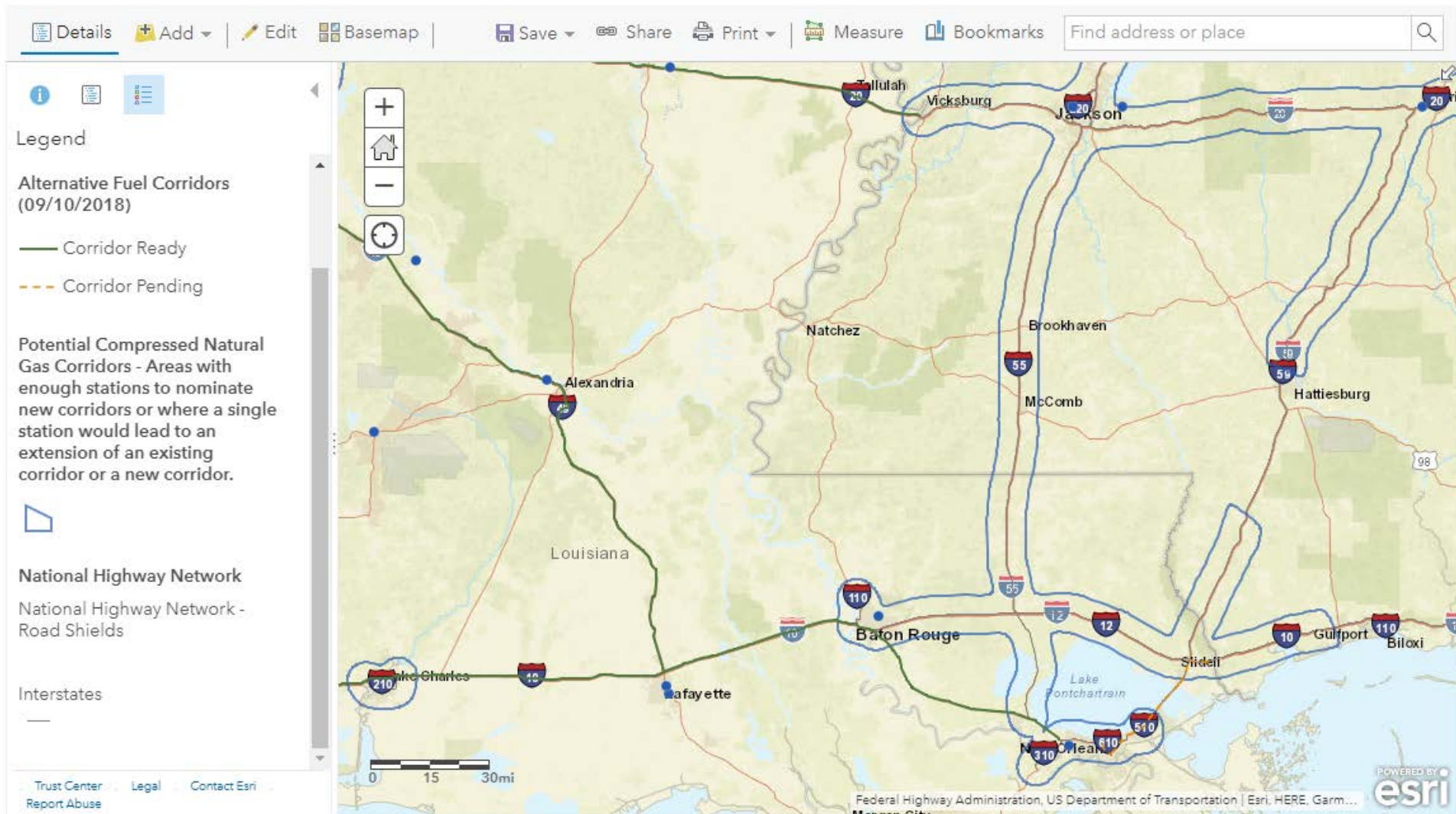
New Map ▼ Create Presentation 👤 Johanna ▼



Interactive Maps

ArcGIS ▼ Compressed Natural Gas (CNG) Corridor Map ✎

New Map ▼ Create Presentation 👤 Johanna ▼



Need Help?

For information about **station** information email Stephen.Lommele@nrel.gov

For information about **corridor** information email johanna.levene@nrel.gov.

Resources

Station Locator: <https://afdc.energy.gov/stations>

Station Data for Corridors: <https://afdc.energy.gov/corridors>

Alternative Fuels Data Center

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- CONSERVE FUEL
- LOCATE STATIONS
- LAWS & INCENTIVES
- Maps & Data
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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

<https://afdc.energy.gov/evi-pro-lite>

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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?



State



City/Area



Vehicles

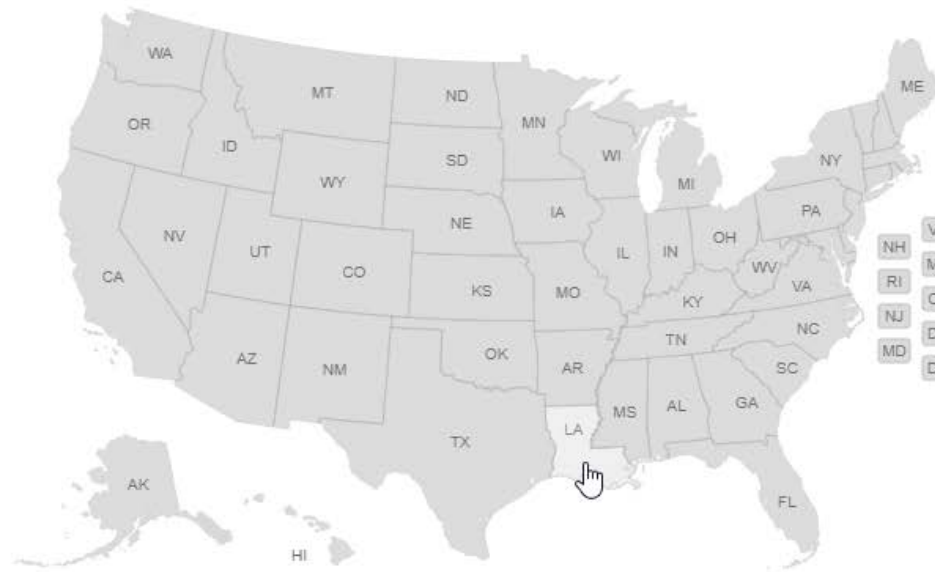


Results

Start Over

Choose a State

Select State ▼



- VT
- NH
- MA
- RI
- CT
- NJ
- DE
- MD
- DC

Alternative Fuels Data Center

Search the AFDC

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FUELS & VEHICLES

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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?



State



City/Area



Vehicles



Results

Start Over

Choose a major urban area in Louisiana

Alexandria

Baton Rouge

Hammond

Houma

Lafayette

Lake Charles

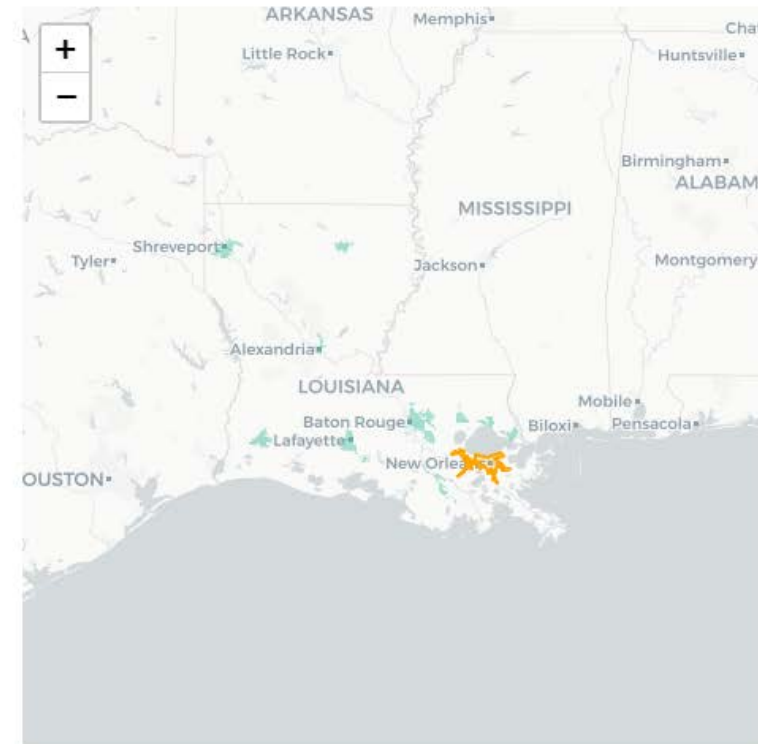
Mandeville–Covington

Monroe

New Orleans

Shreveport

Slidell



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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?



State



City/Area



Vehicles



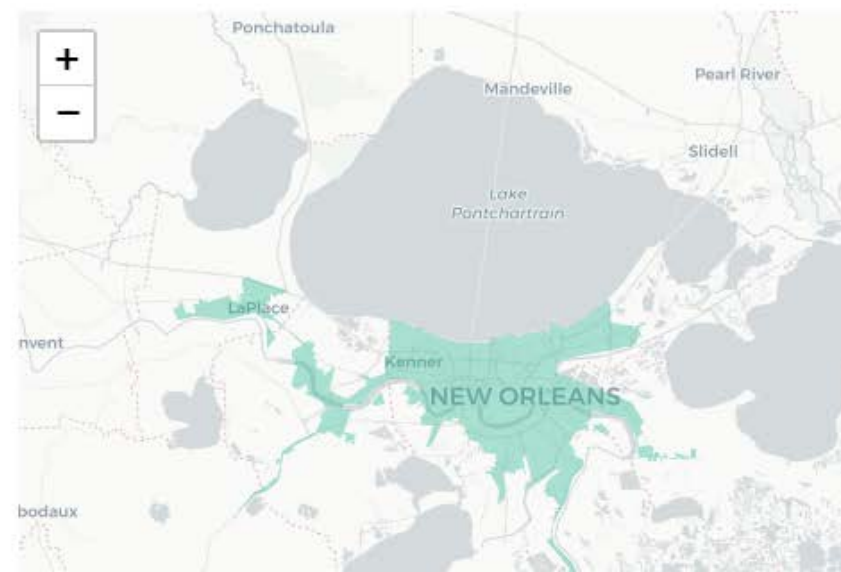
Results

Start Over

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

For reference, there were 744,100 light-duty vehicles on the road in the New Orleans area as of the end of 2016 and 280 of those were plug-in electric vehicles.

Calculate

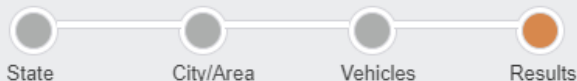




Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite

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?



Start Over

Your Results

In the New Orleans area, to support 1,000 plug-in electric vehicles you would need:

21 Workplace Level 2 Charging Plugs

17 Public Level 2 Charging Plugs

There are currently 60 plugs with an average of 2.0 plugs per charging station per the Department of Energy's [Alternative Fuels Data Center Station Locator](#).

3 Public DC Fast Charging Plugs

There are currently 1 plugs with an average of 1.0 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): 280

Light Duty Vehicles (as of 2016): 744,100

Number of vehicles to support

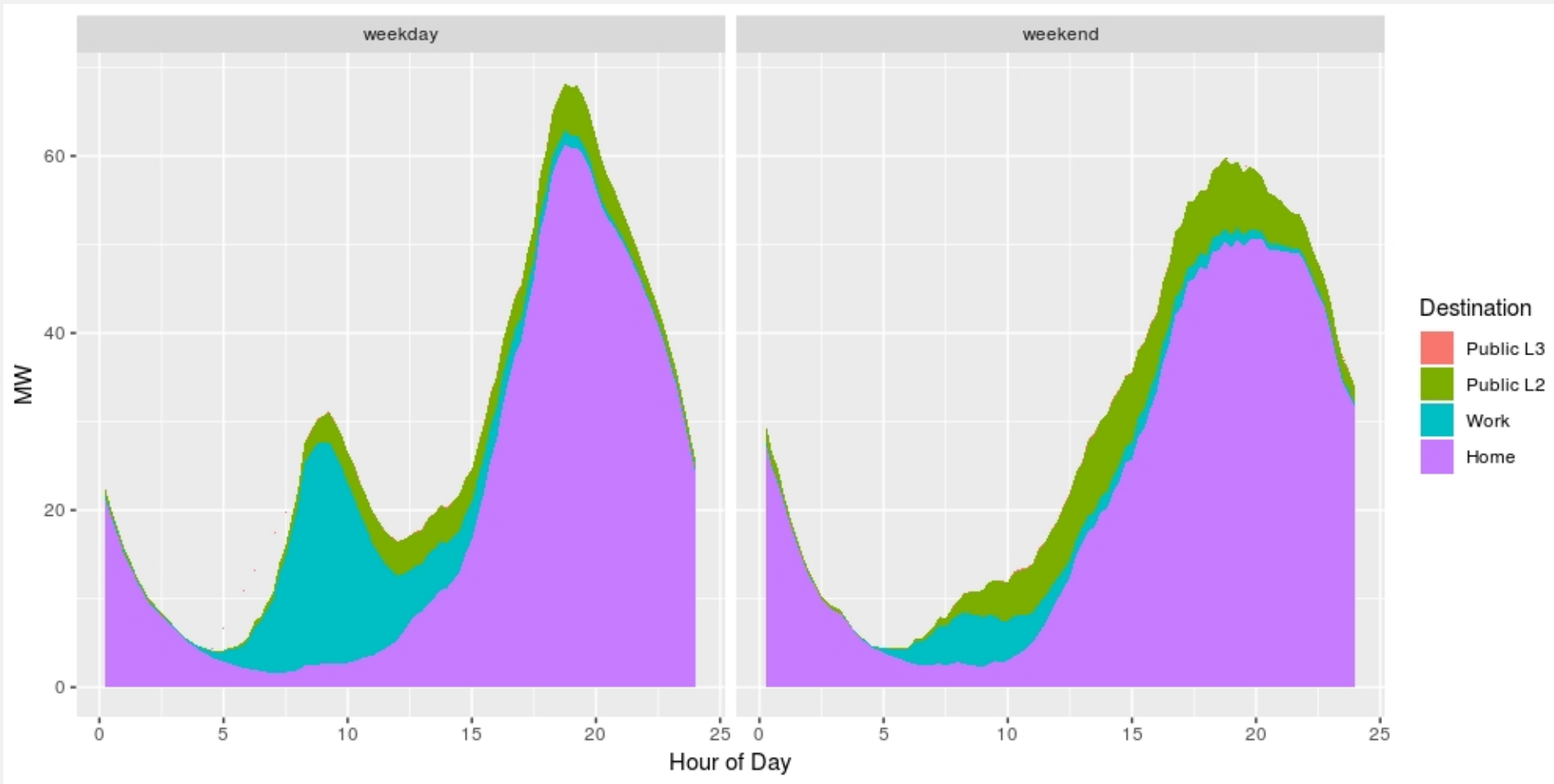
Vehicle Mix		
Plug-in Hybrids 20-mile electric range	<input type="text" value="15"/>	%
Plug-in Hybrids 50-mile electric range	<input type="text" value="35"/>	%
All-Electric Vehicles 100-mile electric range	<input type="text" value="15"/>	%
All-Electric Vehicles 250-mile electric range	<input type="text"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



Coming June 2019 the EVI-Pro Lite tool will also estimate load profiles for EV charging.

Future Enhancement – Load Profile

Thank You

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AF Corridor Analysis Summary

- Analyze station data on corridors to identify existing stations and gaps where future stations can be located
 - Using tools such as the AFDC Station Locator & Corridor Tools and EVI-Pro Lite
- Review important metrics such as VMT, freight volume
- Initiate conversations with property hosts for potential station locations
 - Investigate upgrading LPG Secondary sites to Primary vehicle fueling capabilities, upgrading Level 2 sites to include DCFC, as well as providing both CCS and CHAdeMO connectors.
- Hold workshops/meetings to identify priority corridors in the state/region
- Work with State/Planning agencies to identify potential funding
 - CMAQ Priority for EV & CNG stations on designated corridors
 - VW Appendix D Light Duty Zero Emission Vehicle Supply Equipment Funding
- Initiate/participate in planning with neighboring states
 - Electrify America Cycle 1 and 2 development
 - ZEV MOU states & MOU for Regional EV Plan for Western States (REV West)
 - Informal coordination between States & Clean Cities Coalitions

For More Information

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Resources

FHWA Alternative Fuel Corridor website:

http://www.fhwa.dot.gov/environment/alternative_fuel_corridors/

MUTCD Memorandum – Signing for Designated Alternative Fuel Corridors:

https://mutcd.fhwa.dot.gov/resources/policy/alt_fuel_corridors/index.htm

DOE/NREL Alternative Fueling Station Locator & Corridor Tools:

<https://afdc.energy.gov/stations>

<https://afdc.energy.gov/corridors>

Motorweek Video Segment on AF Corridors:

<https://www.youtube.com/watch?v=QZhLFqTXb-g>