SECO
State Energy Conservation Office

North Central Texas Council of Governments

Dallas-Fort Worth CLEAN CITIES

Resilient EV Charging and Minimizing Grid Impact

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December 4, 2024

Welcome & Housekeeping

1. Please keep you microphone muted until it is time for questions or asked otherwise.
2. Put your name and organization in the chat.
3. We will have an open discussion at the end.
4. The webinar slides and audio recording will be posted on the Conserve North Texas website under News/Events → Event Archive at the link below. Follow-up emails to come. http://conservenorthtexas.org/event-archive

Webinar Sponsor

NCTCOG receives funding through SECO to work on energy management and efficiency projects within the region. As part of this work, we have provided workshops, webinars, and technical assistance on a variety of energy management, energy efficiency, water efficiency, and renewable energy topics.

Regional Energy Management Program

North Central Texas Council of Governments

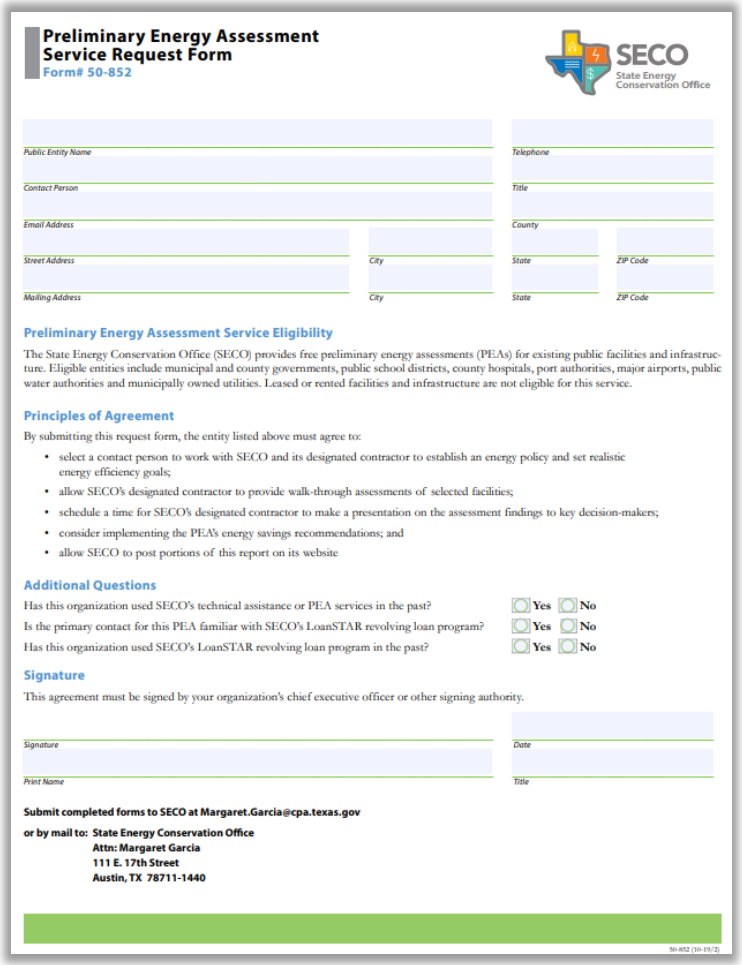
SECO State Energy Conservation Office

Donate the value of your time through the in-kind match form

Preliminary Energy Assessments (PEAs)

Preliminary Energy Assessments are provided by the State Energy Conservation Office and offer cost effective resource efficiency measures entities can implement to decrease energy consumption at **no cost to you!**

- Help guide the development of an energy management policy
- Provides facility benchmarking using ENERGY STAR Portfolio Manager
- Recommended maintenance procedures
- Develop efficiency level guidelines for equipment purchases



Preliminary Energy Assessment Service Request Form
Form# 50-852

SECO State Energy Conservation Office

Public Entity Name | Telephone
Contact Person | Title
Email Address | County
Street Address | City | State | ZIP Code
Mailing Address | City | State | ZIP Code

Preliminary Energy Assessment Service Eligibility

The State Energy Conservation Office (SECO) provides free preliminary energy assessments (PEAs) for existing public facilities and infrastructure. Eligible entities include municipal and county governments, public school districts, county hospitals, port authorities, major airports, public water authorities and municipally owned utilities. Leased or rented facilities and infrastructure are not eligible for this service.

Principles of Agreement

By submitting this request form, the entity listed above must agree to:

- select a contact person to work with SECO and its designated contractor to establish an energy policy and set realistic energy efficiency goals;
- allow SECO's designated contractor to provide walk-through assessments of selected facilities;
- schedule a time for SECO's designated contractor to make a presentation on the assessment findings to key decision-makers;
- consider implementing the PEA's energy savings recommendations; and
- allow SECO to post portions of this report on its website

Additional Questions

Has this organization used SECO's technical assistance or PEA services in the past? ☐ Yes ☐ No
Is the primary contact for this PEA familiar with SECO's LoanSTAR revolving loan program? ☐ Yes ☐ No
Has this organization used SECO's LoanSTAR revolving loan program in the past? ☐ Yes ☐ No

Signature

This agreement must be signed by your organization's chief executive officer or other signing authority.

Signature | Date
Print Name | Title

Submit completed forms to SECO at Margaret.Garcia@cpa.texas.gov

or by mail to: State Energy Conservation Office
Attn: Margaret Garcia
111 E. 17th Street
Austin, TX 78711-1440

50-852 (10-19/2)

Source: SECO

Agenda

- NCTCOG Overview
- Need for Resilient EV Charging
- Texas' Energy Demand, Forecast and Grid Outages
- Minimizing Impact of EV Charging
- EV Charging Resiliency Technologies
- Case Studies
- Planning Resilient EV Charging Project

Who We Are

Regional Planning Agency

North Central Texas Council of Governments

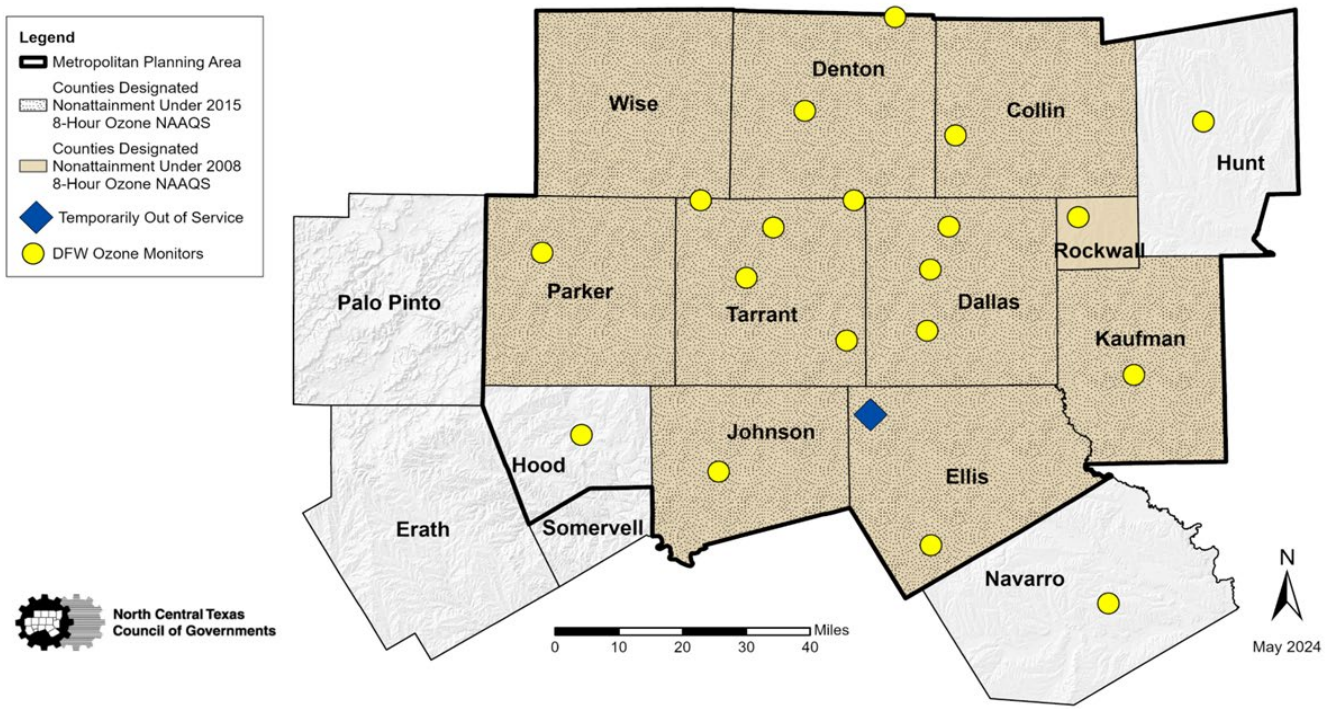
Metropolitan Planning Organization (MPO)

Regional Transportation Council

Department of Energy-Designated Clean Cities Coalition

Dallas-Fort Worth CLEAN CITIES

Sister Coalitions in Texas:
Alamo Area Clean Cities (San Antonio)
Houston-Galveston Clean Cities
Central Texas Clean Cities (Austin)



Need for Resilient EV Charging

Increasing EV adoption by local governments

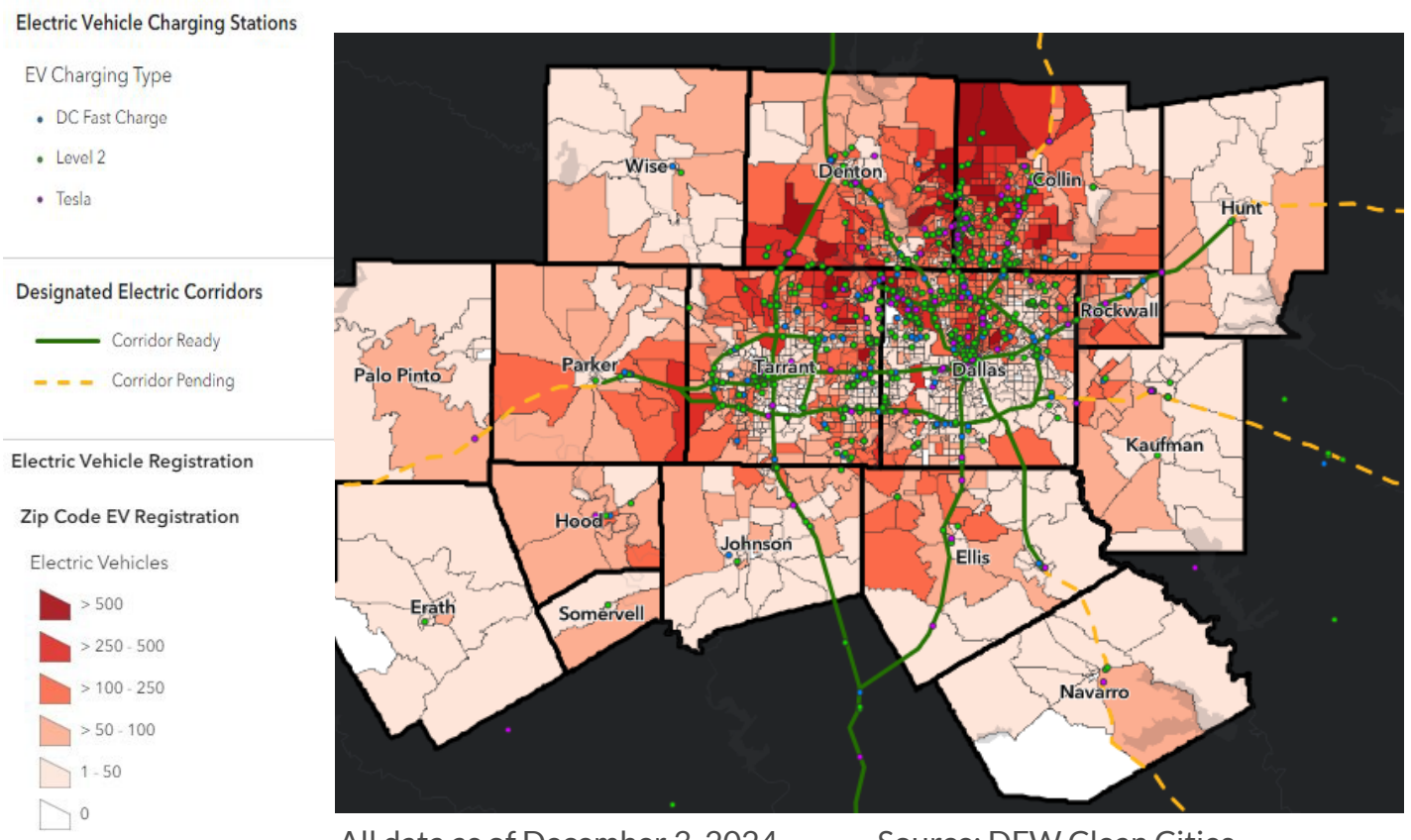
More EVs assigned to critical operations
- Emergency services, refuse collection, public works, dump trucks, freight transport

Texas grid - Increasing power demand
- Transportation electrification
- Weather events
- Population and economic growth

Source: City of Plano

[Planning for Resilient EV Charging Infrastructure whitepaper]
- Developed by NCTCOG under contract to Texas State Energy Conservation Office
- www.conservenorthtexas.org -> Case Studies

Texas EV Data and Trends



All data as of December 3, 2024 Source: DFW Clean Cities

Electric Vehicle (EV) Registration Data

www.dfwcleancities.org/evnt -> EVs and Texas

Region	December 2023	December 2024	Increase
Texas	230,806	331,292	44%
Dallas-Fort Worth (DFW)	89,105	120,798	36%
Austin	47,336	65,447	38%
San Antonio	22,235	29,298	32%
Houston	58,785	83,010	41%

Charging Sites Statewide (includes Tesla):

- 3,110 Level 2
- 595 DC Fast

https://afdc.energy.gov/stations

Texas Grid Outages

More outages in last 5 years than any other state

Each outage in the last 5 years for all causes lasted an average of 160.4 minutes

Weather-related outages are expected to increase

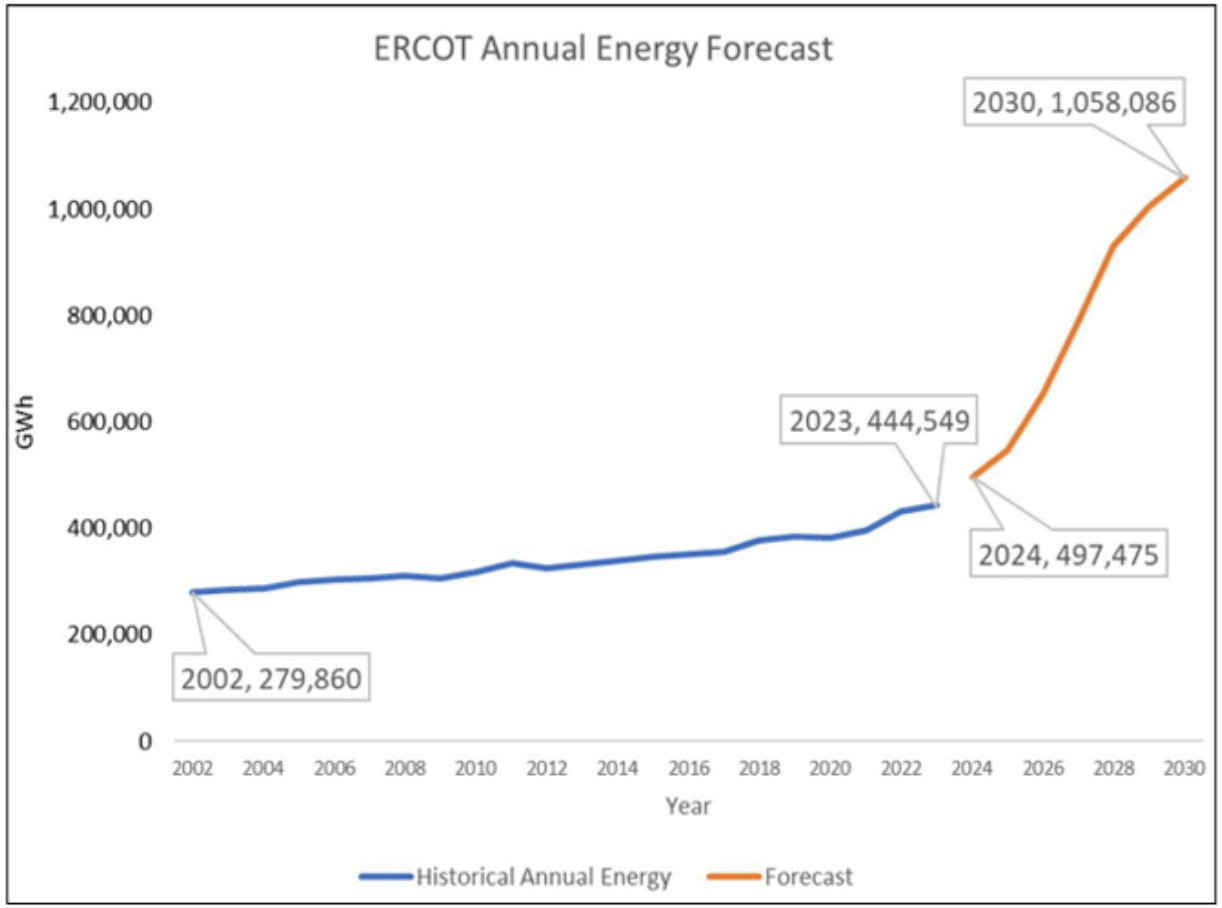
Cause of Outage	Outages Last 5 Years (2019-2023)	Outages Last 20 Years (2003-2023)	Percent of Outages in Last 20 Years Occurring in Last 5 Years
All Causes	263	435	60%
Severe Weather	111	193	58%

Source: Payless Power

ERCOT's Annual Energy Forecast

Average annual growth rate

- 17.1% from (2024-2027)
- 3.1% (2014-2022)



Source: Load Forecast (ercot.com)

ERCOT Demand Forecast

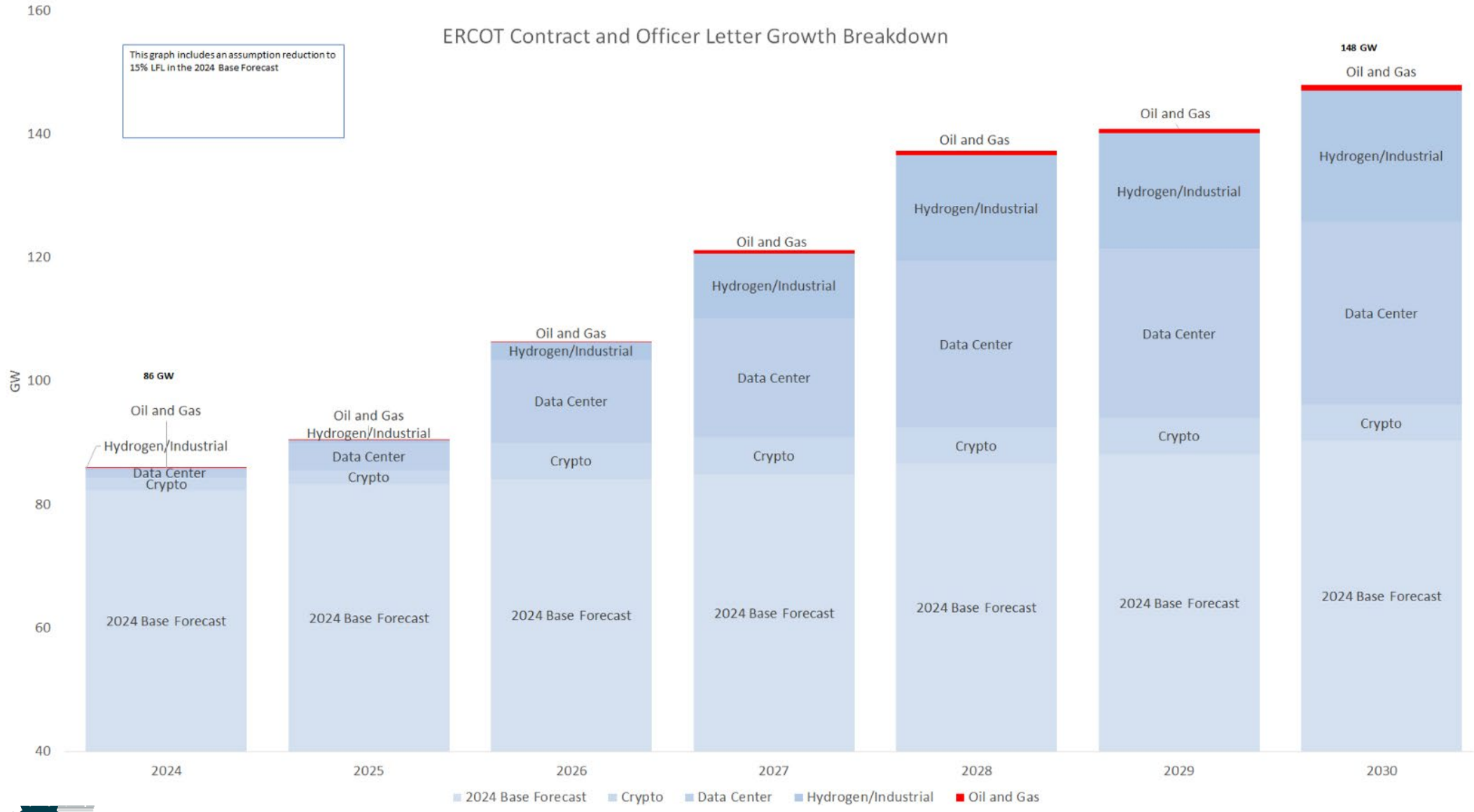
Largest contributors to demand increase (Large load)

- Cryptocurrency mining
- Data centers – artificial intelligence (AI) usage contributing factor
- Hydrogen production
- Large industrial loads

EV 2029 Forecast

- 998,000 LDV and 103,000 MDV/HDV will be EVs
  - 96% of light-duty EVs and 93% of medium- and heavy-duty EVs in ERCOT territory
- **EV charging will only add 1.25% to ERCOT's load forecast**
  - up from 0.2% in 2023

ERCOT Large Load Growth



Source: Load Forecast (ercot.com)

Minimizing Grid Impact of EV Charging

Comply with conservation requests (13 issued in 2023)

Texas Advisory and Notification System (TXANS) – ERCOT early notification of higher demand

- ERCOT Weather Watch
  - Weather conditions and expected demand may lead to lower reserves
- Voluntary Conservation Notice
  - Voluntarily conserve power during specific periods if safe to do so
- Conservation Appeal – potential for ERCOT to enter emergency operations
  - Voluntarily conserve power during specific periods if safe to do so

Avoid EV charging when grid is most constrained

- Based on ERCOT Monthly Outlook on Resource Adequacy reports for March–October, **7 PM– 9 PM had highest risk for conservation requests**
- Smart Charging Management – can optimize charging based on grid constraints, electricity prices, vehicle's charging capacity, etc.

EV Charging Resiliency Technologies

Technology	Lessens Grid Impact	Enables Off-Grid Charging	Case Study
Smart Charging Technology	x		x
Energy Storage System (Battery, Hydrogen)	x	x	x
Solar	x	x	x
Wind	x	x	
Generators (propane, diesel, natural gas)		x	
Mobile Charging		x	
Vehicle to Vehicle (V2V) Charging	x	x	
Microgrids	x	x	x

Smart Charging Management

A system that can dynamically optimize charging across multiple chargers

Lessens grid impact

Can consider:

- Grid constraints
- Electricity prices
- EV battery percentage
- Desired charge level
- EV charging capacity
- Timed charging

If integrated with distributed energy resources (DERs)

- Can coordinate electricity generation through certain DERs to be low carbon
- DER – Technology that provides energy generation and/or energy storage to provide electricity where needed

Battery Energy Storage System (BESS)

Stored energy for later use and from various types of energy generation

Lessens grid impact; is scalable

Standalone or connected to the grid

Battery integrated charger allows for off-grid charging

Grid Connected BESS
- Batteries charged by grid
- During an outage, the battery is a backup power source

Standalone Charger w/BESS
- Relies on stored energy
- Charged by external source (i.e. solar)

BESS size considerations
- EV charging demand
- Hours of off-grid charging needed
- Example: BESS with 500 kWh of energy storage provides
  - 10 hours of off-grid charging
  - EV charging demand 50 kW

Hydrogen Fuel Cell Energy Storage

Hydrogen fuel cell integrated with an EV charger is an emerging technology

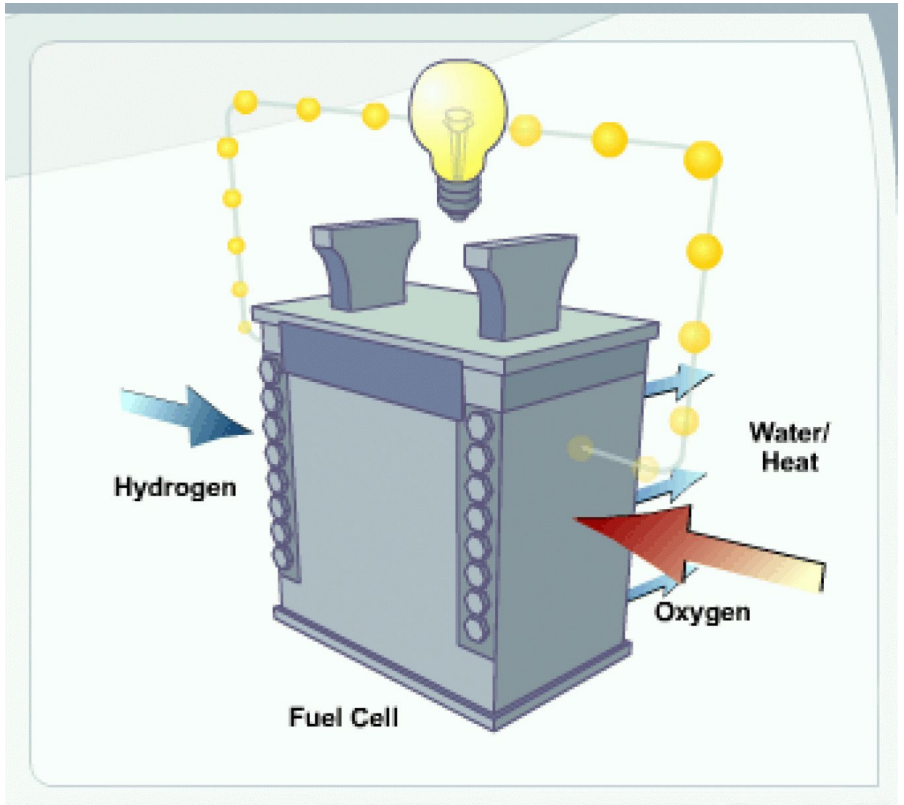
Lessens grid impact; is scalable

Emits electricity, water, and heat

Standalone charger
- Powered by fuel cell
- Fuel cell refueled with hydrogen

Grid connected charger
- Hydrogen fuel cell is power backup

Hydrogen fuel cells for backup power and stationary power for electricity generation currently used in microgrids and larger scale applications



Source: Department of Energy

Solar

Renewable energy source

Lessens grid impact; is scalable

Charger powered by either energy storage, solar panels, or both

Off-grid capable when integrated with energy storage (usually battery)

- Battery recharged by solar PV

Added energy storage needed for long term resiliency

Source: Beam Global

Wind

Renewable energy source

Low lifecycle emissions

Efficiency gains when locally deployed

Lessens grid impact

Scalable
- 10s of KW to several MW

DER that can be added to a microgrid

Source: NREL

Generators

Powered by a variety of fuel sources: propane, diesel, natural gas

Combustion-fueled generators

Advantages

- Lower upfront cost compared to battery and solar backup
- Higher power density and fuel efficiency
- Depending on size could be mobile
- Propane's carbon intensity is lower than electricity generated from the Texas grid mix

Disadvantages

- Most have a higher carbon intensity than the rest of the technology options
- Maintenance and fuel costs are higher than battery and solar backup
- Non-fuel operating cost of diesel and natural gas generators are higher than solar or battery

Source: Texas Propane Gas Association

Mobile Charging

Electricity generation can be from energy storage (battery, supercapacitors, or hydrogen fuel cell), propane, natural gas, or diesel

Larger scale platforms can accommodate charging multiple vehicles

Charging examples

- No permanent charging infrastructure
- Centralized fleet charging is inaccessible
- Stranded EVs
- Power outages
- Inoperable chargers

Advantages

- Deploy at any location
- No need for permits, electrical upgrades, or construction

Source: EV Power Pods

Examples of Average Costs for Backup Power Systems

System[a]	Upfront Costs	Non-fuel Annual Operating Costs	Fuel Costs
Diesel Generators	$800/kW [3]	$35/kW [3]	$0.27/kWh[c]
Natural Gas Generators	$1,000/kW [3]	$35/kW [3]	$0.10/kWh[d]
Solar Power	$1,630 – 1,840/kW [4]	$5-6/kW [4]	$0/kWh
Battery Energy Storage System	$392 – 493/kWh[b] [5]	$4-5/kWh [5]	$0-$0.13/kWh[e]

a. Due to its niche applications, backup power fuel cell system costs are not widely reported.
b. The relevant cost metric for battery storage systems is energy (kWh) rather than power (kW).
c. Based on $4 per gallon offroad diesel price.
d. Based on $10 per thousand cubic feet commercial gas price.
e. Lower end assumes onsite solar generation and upper end based on average commercial electricity cost.

Source: Power-Resiliency-Electric-Fleets | Environmental Defense Fund

Bidirectional Charging

EVs able to discharge energy from the battery

- A type of mobile energy storage

Provides alternating current to something else

- Vehicle-to-Load (V2L)
  - i.e., appliances and electric tools
- Vehicle-to-Vehicle (V2V)
  - Possible with proper plug adapter and charging connector

EV buses

- Potential to charge multiple EVs given their battery size and quantity of buses
- Storage capacity ranges:
  76 kWh – 660 kWh

Various other light-duty and medium duty vehicles (i.e. Ford F-150 Lightning, Rivian R1T, Hyundai Ioniq 5 & 6, Kia EV6, etc.)

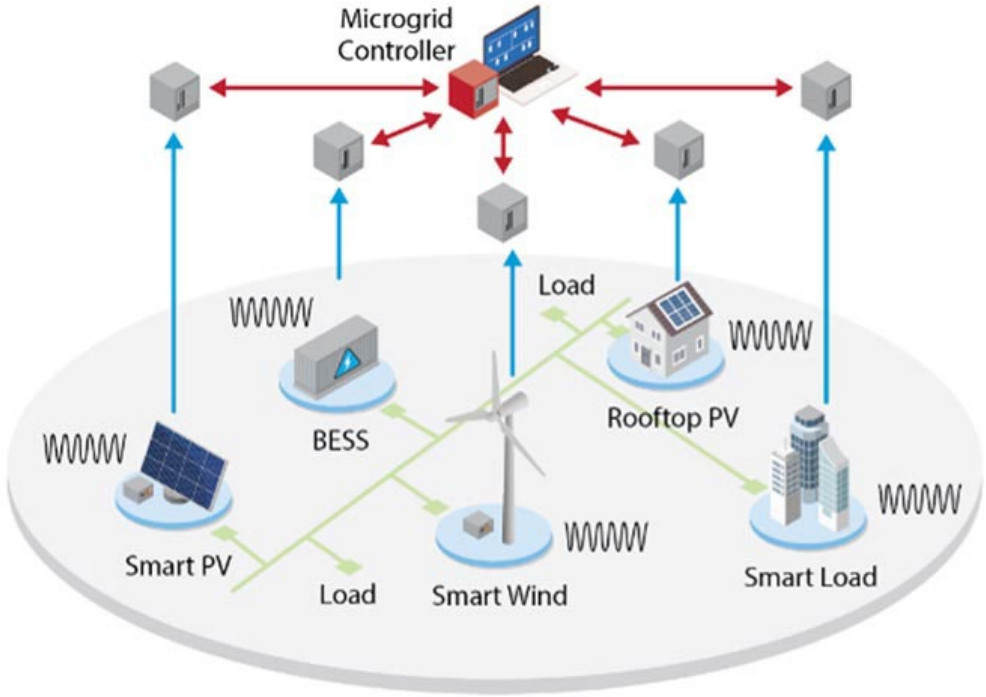
Microgrids

Combination of DERs and electrical loads working as one unit

Can operate connected to the grid or off-grid ("island" mode)

Advantages

- Increased power transmission efficiency due to closer proximity to users
- Reduces peak demand pressures enhancing overall energy security
- Can include more renewable energy sources than the macrogrid
- Scalable



Source: NREL

Case Studies

City of Allen, Texas - A Superhub Project by X Charge North America

- 20 charging spaces @ 200kW - 400kW per port
- 3MWh of battery storage

City of Phoenix, Arizona – Transportation Electrification Action Plan

- Transitioning 200 gas powered LDVs to EVs by 2030
- Will use energy storage and microgrids
- Implementing managed charging and fleet use guidelines that reduce utility expenses and demand charges during peak times

US Department of Agriculture Forest Service – Remote Charging Station

- Off-grid solar and battery storage
- 5 vehicle fleet

Montgomery County, Maryland – Brookville Smart Bus Depot and Equipment Maintenance & Transit Operation Center (EMTOC)

- 6.4 MW microgrid
- 5.5 MW solar – 2 MW battery storage, 1 MW hydrogen electrolyzer

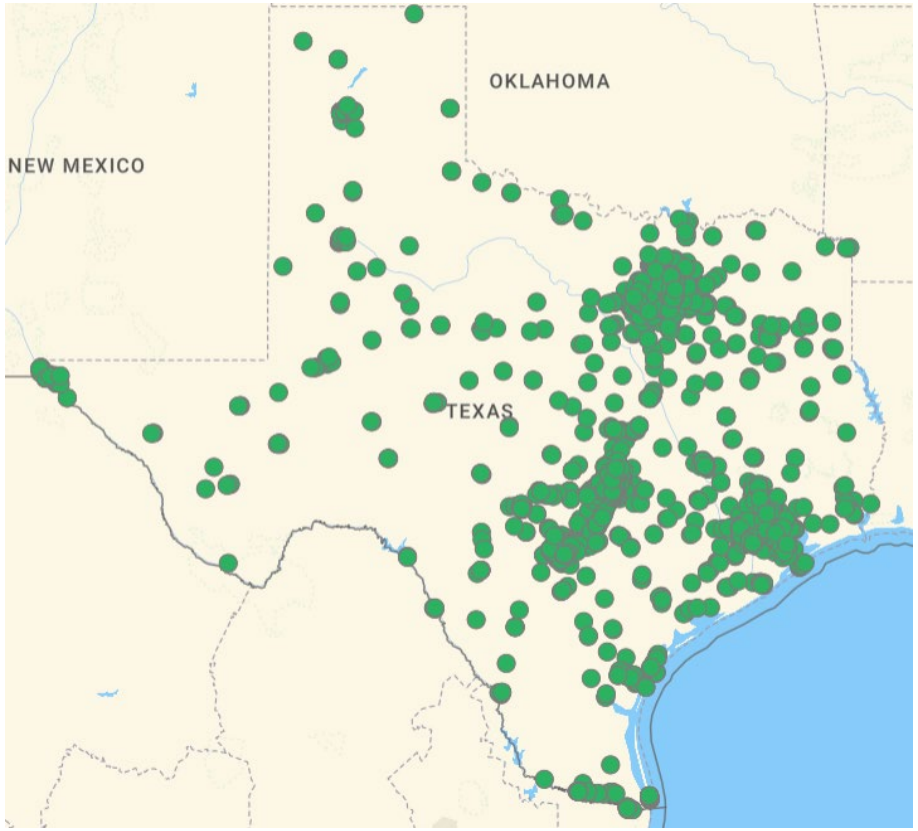
Challenges and Considerations

Delayed planning for EV charger resiliency
- Greater financial and time impact

Lack of visibility to real-time status of EV chargers

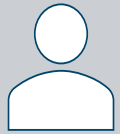
Lack of risk assessment to convey need for resilient EV charging

Lack of staff and resources

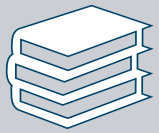


Source: Alternative Fueling Station Locator

Next Steps for Local Governments



Reach out to peers who have successfully implemented resilient charging infrastructure



Learn about available resilient technologies

Consider resilient technologies when planning procurements of EVs and EV infrastructure

Avoid charging between the hours of 7 PM - 9 PM when demand is highest

Next Steps for NCTCOG

Objectives:

- Create resilient EV charging plan for North Central Texas region
- Implement plan & enhance critical EV infrastructure
- Evaluate strategies & equipment via:
  - Tabletop Scenario
  - Technology Demonstration

Impacts:

- Guide stakeholders with actionable recommendations
- Ensure critical EV travel continuity:
  - Evacuation routes
  - Critical facilities & services
  - Freight operations

Project Background

Funded by Bipartisan Infrastructure Law, Department of Energy Joint Office of Energy & Transportation

- $1.5 million award
- 30-month project expected to finish early 2027

Led by NCTCOG Transportation and Emergency Preparedness staff

Key partners:

- Dallas-Fort Worth International Airport
- Oncor Electric Delivery
- Dallas Area Rapid Transit
- City of Irving
- City of Dallas
- Dallas County
- North Texas Innovation Alliance
- City of Fort Worth
- Tarrant County

Regional stakeholders to provide support of project initiatives via:

- Utility, equipment, fleet, and infrastructure access
- Data sharing and subject matter expertise
- Stakeholder engagement
- Demonstration exercise participation
- Plan development, distribution, and adoption

Closing Reminders

Link to the whitepaper

NCTCOG Whitepaper: Planning for Resilient EV Charging Infrastructure | Conserve North Texas

Reminder to complete the in-kind match form

Please complete the webinar evaluation here

In-Person Local Government Energy Reporting Workshop

- January 16, 2024, 10:00 AM – 11:45 AM
- NCTCOG Offices, Transportation Council Room
- Registration Link

Contact Us

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