Braving the Storm

Des Moines, IA: City Fleet EV Deployment in Cold Weather

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CLIMATE MAYORS

Electrification Coalition

Sourcewell

CITY OF DES MOINES

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Introduction

The Climate Mayors Electric Vehicle Purchasing Collaborative (the Collaborative) is a joint effort by Climate Mayors, the Electrification Coalition, and Sourcewell working toward accelerating the transition of city fleets to electric vehicles (EVs). By creating a new and innovative cooperative purchasing mechanism, the Collaborative is reducing major barriers to fleet electrification for cities and other public agencies.

Climate Mayors is a network of over 450 U.S. mayors who are committed to taking meaningful action on climate change. The Electrification Coalition (EC) is the non-partisan, non-profit organization that leads implementation of the Climate Mayors' transportation electrification initiative, leveraging its broad experience as a municipal partner in accelerating EV adoption on a mass scale. Sourcewell, a public procurement agency, facilitates a competitive solicitation and award process for vehicles and service equipment on behalf of their 50,000+ members across North America.

The Collaborative's partners have come together to offer a one-stop platform which connects cities with a growing selection of EVs and charging stations, transparent pricing, policy guidance, technical resources, assessment tools, and financing options that can leverage the federal EV tax credit to reduce the up-front costs of EVs and support cities' fleet electrification. The Collaborative also provides cities with training, best practices, educational materials, and analysis to support the successful transition of municipal fleets to electric.

Overview

Des Moines, the capital of Iowa, has built a reputation for forward-thinking regional planning focused on sustainability. Its dedication to innovative solutions is exemplified through its "Tomorrow Plan," which calls for centrally planned growth and resource consumption. This focus on innovative sustainability solutions extends to the City's dedication to EV adoption within the municipal fleet.

With a metropolitan population of almost 700,000 residents, Des Moines is home to a large number of international corporations, including many in the insurance and tech sectors. City fleet vehicles must provide reliable services across a 90-square-mile census-designated area, occasionally in adverse weather conditions. Like many locations across the Midwest, the City of Des Moines sees wide swings in temperature between summer and winter. Summer highs often hit the 90-degree Fahrenheit mark, occasionally reaching 100. Winters in Des Moines are colder than in Chicago, with low temperatures falling below zero. Winter also brings frequent snowfall accumulations of several inches, with occasional blizzard conditions.

The EC has developed an analysis tool to provide fleets with data-driven recommendations for vehicle electrification. The Dashboard for Rapid Vehicle Electrification (DRVE) tool compares existing fleet vehicles within specific applications and provides recommendations for electrification in the near-term, mid-term, and long-term. The results include accurate price projections, charging infrastructure costs, and potential emissions reductions based on local energy generation. Fleets can find additional information and request access to the tool through the EC: electrificationcoalition.org/DRVE

Historically, fleet managers of U.S. cities with cold winters have been reluctant to implement EVs because of concerns over battery capacity and range reductions associated with electrically powered heaters. However, there is ample evidence of successful cold-climate EV deployment across the globe. In Norway, 87% of new vehicle registrations in December 2020 were electric.[1] In 2019, 56% of its total vehicle registrations were electric, ahead of Iceland at 25% of all vehicles registered in the same year.[2] Many northern countries continue to lead and serve as examples for cold-weather EV performance.

Early Milestones

In 2009 the Des Moines City Council set a goal to reduce the City's environmental impacts. This early goal was broad and did not include specific dates or emissions reduction targets. But it set the stage for more ambitious action on climate and the environment. City leadership asked its staff to reduce transportation emissions and fuel consumption, and Fleet Manager Brian Bennett worked quickly to procure the City's first hybrid vehicles, Toyota Prius hatchbacks. These vehicles reduced City emissions and fuel consumption and were a good option for the fleet at the time.

Over the next decade, the City deployed 27 Toyota Priuses and five Ford C-MAX hybrids, totaling 32 gasoline-hybrid units. By 2019, all-electric vehicles capable of running several days without the need to charge were available. The Nissan LEAF was priced lower than the City's maximum vehicle replacement price, making all-electric vehicles a viable option. And compared to a gas-hybrid, all-electric vehicles are significantly less expensive to own, maintain, and fuel.

The City Fleet

The City of Des Moines' fleet has 887 vehicles. As is typical in municipal fleets, pickup trucks make up a substantial portion of the light-duty vehicle composition, at 22% of the light-duty fleet. The Des Moines fleet includes 157 medium- and heavy-duty units, or 18% of the total. Careful analysis of a fleet's composition is crucial as a city begins to implement EVs. This analysis allows a fleet manager to accomplish several important steps:

1. Identification of early models and applications to target for electric transition
2. Identification of charging requirements
3. Development of a timeline to achieve City electrification goals and positive budgetary impacts

The City worked with the Electrification Coalition to identify vehicle models that would be good candidates for electrification. A detailed review of the fleet makeup and operations through the DRVE tool revealed that these early EV deployments should take place within the property inspection department. This application is particularly well suited to all-electric cars because of daily use patterns and the operators'

1. *https://cleantechnica.com/2021/01/06/norway-hits-record-87-plug-in-ev-share-66-pure-electrics-in-december/*
2. *https://www.virta.global/global-electric-vehicle-market*

ability to perform everyday tasks without a pickup bed or large towing capacity. Inspection staff must often complete lengthy documentation on-site, which can result in extended idling of conventional vehicles. The Climate Mayors EV Purchasing Collaborative helped the City of Des Moines identify the most promising vehicle models and applications and explore procurement options.

Like many cities, the City of Des Moines procured vehicles through approved, direct purchase contracts. This standard route for procurement can pose challenges to cities working to electrify their fleets. After analyzing several procurement options, the Des Moines City Council agreed to procure these initial four Nissan LEAFs in a closed-end lease through the Collaborative in 2019.

For the initial procurement, the City took advantage of the flexibility available through the Collaborative. Paying for the vehicles in two annual payments reduced interest costs, while also taking advantage of a portion of the $7,500 federal EV tax credit. At the end of the 36-month lease, the City has an option to pay a $5,578 residual buyout for a total price of $23,898 per vehicle, and ownership will be transferred to the City. Once fuel and maintenance savings are factored in, the Nissan LEAFs reached cost parity with the City's conventional light-duty municipal sedan. EVs typically achieve fuel-cost savings of 50-60% of comparable ICE vehicles and do not require the same level of regular maintenance. As an added benefit of working with the Climate Mayors EV Purchasing Collaborative, the procurement process was shortened by 60 days.

Gaining Buy-In and End-User Acceptance

Misconceptions about EV range, durability, and performance are common. The ability to build end-user acceptance is a critical aspect of early-stage fleet electrification. The City of Des Moines's four Nissan LEAFs were the first fully electric vehicles in the City fleet, so some level of skepticism was expected. When some of the City staff expressed concerns, the fleet manager skillfully considered each concern and set about addressing it individually. When asked about lack of ground clearance, the fleet manager checked the clearance on the fleet's Ford Explorers and found that the Nissan LEAF offered similar clearance. The LEAF's interior cargo space was compared with that of existing fleet vehicles and found to be comparable. End-user acceptance and general comfort with the switch from a traditional ICE vehicle is an essential aspect of early-stage fleet electrification, so drivers were given several opportunities to express concerns and ask questions.

2020 Nissan Leaf S	Per Unit	All Units
MSRP	$31,599	$126,396
Federal Tax Credit	-$7,500	-$30,000
Lease Savings	-$201	-$804
Des Moines Price	$23,898	$95,592
Total Savings	**$7,700**	**$30,800**

Initial Experience and Cold Weather Application

The City's first four EVs were deployed in October 2020. Initially, these vehicles were expected to be delivered earlier in the year to allow for a longer run time and more user experience before the onset of cold weather. However, fallout from the COVID-19 pandemic and associated manufacturing delays across the automotive industry caused the units to arrive later than planned. Some City employees expressed concerns about range and winter driving conditions. After driving the LEAFs for six months, end-users were surveyed. Questions focused on initial impressions, range, driver experience, and of particular interest, winter driving capabilities and the impact of temperature on vehicle range. Before the survey was sent, department managers were asked about known issues or challenges expressed, and none were reported. The fleet maintenance team was also interviewed and noted no service had been required on these vehicles since deployment.

The survey findings were very encouraging, with a largely positive experience reported by all drivers. Initial concerns were put to rest by the vehicles' actual performance in daily service. The drivers gave the cars high ratings for acceleration, regenerative braking, and no vehicle downtime due to regular maintenance. Most drivers stated they would prefer that their next vehicle be electric, with some preference given to a pickup truck.

The drivers also noted some challenges during the first winter season. Running the heat does affect an EV's range, as it consumes energy from the battery. (An ICE vehicle's range is also reduced when the heat system is running, because it requires more fuel.) This reduction in range can be mitigated by pre-warming the vehicle while still plugged in. If possible, storing the vehicle inside a garage can be helpful. In most cases, EVs are recommended for applications that have predictable routes to ensure range limitations will not impact daily use. In extreme temperatures that have greater effects on battery capacity and range, it helps to plan routes that include opportunities to charge during a break.

Fuel and maintenance savings figures are in line with initial projections. As the units acquire more mileage, these savings will be used to inform future procurement decisions. The City has recently approved a procurement of 11 more Nissan LEAFs, which will be on a lease-to own procurement plan. This open-end lease structure will allow the City to access the federal tax credit to reduce overall vehicle cost, with ownership being transferred to the City after a period of 24 months.

Future EV Procurement Plans

Construction is now underway on a new fleet depot that will house fleet maintenance, radio controls for the police department, and public works. The new facility will support charging for 160 electric fleet vehicles, setting the stage for increased fleet electrification. The depot will include conduit, wiring, and increased electrical capacity in circuit panels and transformers. This future-oriented approach is expected to cost one-third less than retrofitting the structure once more EVs are procured.

On Jan. 11, 2021, the Des Moines City Council voted to approve Resolution 32, which calls for a 45% reduction in carbon emissions by 2030. This resolution clarifies the need to accelerate the transition to electric fleet vehicles to achieve the goals set forth by city council. It is also important to note the energy mix used to power these vehicles will become less carbon-intensive over time. The resolution also establishes a community-wide goal to obtain 100% of its electricity from carbon-free sources by 2035. The shift to primarily wind

generation will maximize the emissions reductions available to the City's EVs.

Because medium- and heavy-duty vehicles make up a significant portion of the fleet, these vehicles will also need to be electrified to achieve the City Council's goals. Larger EVs tend to cost more than the current budget allows, but the council is monitoring the EV market taking note when new models become available. And the City is working closely with the Collaborative to identify the most cost-effective way forward.

Conclusion

Transitioning city fleets from ICE to EV models can be daunting, especially for those located in regions with cold winters, where battery capacity and vehicle range are reduced in low temperatures. But successful, long-term use of EVs in cold climates is well documented, as in Norway, Iceland, Des Moines, and other locations. Today's EVs have larger battery capacities, accommodating for reductions in range caused by cold weather. Other strategies, like warming a vehicle while still connected to the charger and garaging vehicles indoors, can be employed to reduce battery capacity impacts. The efficacy of EVs in fleet applications is well established, and the effect of low temperatures on batteries should not deter fleet managers from moving ahead with fleet electrification. As with all vehicle acquisitions, fleet managers must consider model availability, cost savings, application, duty cycle, and drive cycle when introducing EVs into the fleet. Fleet managers should also proactively discuss and address drivers' concerns about using EVs for city fleet applications. An openness to new procurement and ownership models can save money and time. This thoughtful approach has set the City of Des Moines on the path to fully electrify its fleet before 2050, and it is an example for other cities to follow.

For more information about how your agency can partner with the Climate Mayors EV Purchasing Collaborative to take advantage of cooperative purchasing and rich technical assistance, please visit: **www.DriveEVFleets.org**

Or call 800-267-7830

CLIMATE MAYORS

Climate Mayors, founded in 2014, is a bipartisan, peer-to-peer network of U.S. mayors working together to demonstrate leadership on climate change through meaningful actions in their communities, and to express and build political will for effective federal and global policy action. The Climate Mayors coalition has emerged as a key voice and demonstration of the ongoing commitment of U.S. cities to accelerate climate progress.

Electrification Coalition

The Electrification Coalition (EC) is a nonpartisan, not-for-profit group of business leaders committed to promoting policies and actions that facilitate the acceleration of electric vehicle adoption on a mass scale in order to combat the economic, environmental and national security dangers caused by our nation's dependence on oil.

Sourcewell

Sourcewell is a self-supporting government organization, partnering with education and government agencies throughout North America. On behalf of 50,000 members, Sourcewell conducts competitive solicitations, awarding to the most responsive and responsible vendors.