Zero-Emission Transit Vehicle Transition Planning Template

Contact Information:

Michael King, Assistant Director of Electrification & Energy

Michael.King@state.co.us

[**Introduction**](#_r956p9uea3y1)3

[**Glossary**](#_ryiesr5xn1lu)4

[**Transit Agency Information**](#_f3yd4vc9xv8q)5

[**Phase 1: Current Fleet Status, Utility Coordination, and Route Planning**](#_3uyun2my869j)6

[Current Fleet Composition and Future Purchases](#_qhax3166pr2i) 6

[Utility Coordination](#_idssjbcv37fb) 6

[Route Planning](#_br6osxriol8a) 7

[**Phase 2: Goal Setting, ZEV and Electric Vehicle Supply Equipment (EVSE) Procurement, Financial Planning**](#_xnctb7a77wvo)9

[Short and Long-Term Transition Goals/Timeline](#_29wgwadlub0i) 9

[ZEV Procurement](#_d05v6kk76fkh) 10

[EVSE Infrastructure and Facilities Upgrades](#_s3mhtwcuxv01) 10

[Financial Planning](#_f4be79vcjwgg) 11

[**Phase 3: Stakeholder Engagement and Equitable Deployment Plans**](#_o0onfybkxe02)13

[Stakeholder Involvement](#_593gciz27zch) 13

[Plans for Equitable Deployment](#_uuh5cs9t1yp8) 14

[**Phase 4: Charge Management and Workforce Development**](#_j2rdra74hnc)15

[Charge Management](#_mlotj2dhbwgp) 15

[ZEV Workforce Training](#_q6rlzr23u9zw) 16

[**Other Considerations**](#_zd3vxfp8l1xw)18

# 

# Introduction

The Colorado Department of Transportation’s Office of Innovative Mobility (OIM) created this template to aid transit agencies who are just beginning to plan their zero-emission vehicle (ZEV) transition. Its purpose is to help transit agencies be more competitive for state and federal funding opportunities. This template lists key elements for transit agencies to consider and provides space to organize a plan. It is not intended to replace a full, well-researched ZEV transition plan, but is instead a starting point to be built upon over time and as well as customized to the specific needs of each individual transit agency. Links to additional resources can be found in the companion ZEV Transition Timeline document or on the CDOT OIM website. The template was developed by researching current best practices and gathering input from industry professionals.

# Glossary

|  |  |
| --- | --- |
| Alternative Fuel Vehicle | A vehicle that runs on a fuel other than traditional petroleum fuel (such as gasoline or diesel) |
| Demand Charge Rate | Additional fees that utilities charge customers for maintaining a constant supply of electricity |
| Direct Current Fast Charger (DCFC)/ Level 3 Electric Vehicle Charger | Fastest electric vehicle charger. Charges a vehicle with at least 50 kW but ranging up to 150kW, 250kW, or more |
| Disproportionately Impacted (DI) Communities | Census block groups where greater than 40% of households are low income, housing cost-burdened, or include people of color |
| Electric Vehicle Supply Equipment (EVSE) | Equipment that delivers electricity from a source to charge a plug-in electric vehicle (i.e. an electric vehicle charging station) |
| Level 1 Electric Vehicle Charger | Slowest electric vehicle charger, delivers up to 2.5 kW |
| Level 2 Electric Vehicle Charger | Medium electric vehicle charger, delivers up to 19.2 kW |
| Net Present Value | A method of calculating a return on investment |
| Total Cost of Ownership (TCO) | An estimate of expenses associated with the purchasing, maintenance, and decommissioning of a piece of equipment |
| Utility | Electricity provider |
| Zero Emission Vehicle (ZEV) | A vehicle that produces zero exhaust or emission of any criteria pollutant under all possible operational modes and conditions |

# Transit Agency Information

* 1. Transit Agency Name:
  2. Mailing Address:
  3. Agency Contact Name:
  4. Agency Contact Email:
  5. Counties of Operation:
  6. Number of Employees:
  7. Approximate Annual Budget:
  8. Approximate Annual Ridership:

# Phase 1: Current Fleet Status, Utility Coordination, and Route Planning

## Current Fleet Composition and Future Purchases

* 1. Describe your current fleet in the table below. Add rows to the table as necessary.

| **Vehicle Type** | **Vehicle Model Year** | **Fuel Type** | **Estimated Replacement Year** |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Utility Coordination

Local electric utilities play an essential role in any successful zero-emission vehicle (ZEV) planning and implementation process. Proactive coordination between the local utility and transit agency allows both entities to identify fleet electrification needs and constraints early in order to support ease of implementation over the long run. Some utilities have ZEV assistance programs that offer a variety of services to help your ZEV transition, but even when this is not the case, building a relationship with utility staff and better understanding their side of the equation will pay dividends.

Fill out the table below to indicate the information you have received from your utility. It is okay to answer “I don’t know” or “TBD.” Add rows to the table as necessary.

| **Utility** | **Point of Contact** | **Demand Charge Rate** | **ZEV Assistance Program and Services Offered? (Yes/No)** |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

1. Describe how the rate structure and demand charges in your utility area may impact the operation of electric transit vehicles.
   1. Describe your agency’s strategy to minimize the impact of these impacts and/or costs.
2. Describe how the long-term goals of your agency and the local utility align or conflict. How will this support or hinder your transition?

## Route Planning

Analyze your agency’s current bus routes to identify which ones are best suited for early electrification. Depending on a variety of factors, some routes may be easier to electrify than others.

Fill out the table to the best of your ability. It is okay to answer “I don’t know” or “TBD.” Add rows to the table as necessary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Vehicle Type** | **Route** | **Total Route Distance** | **Length of Service Period** | **Elevation Change of Route** | **Other Information** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* 1. Describe what modeling, analysis, and/or real-world trials your agency has conducted to gauge the viability of the specific route or route(s) using electric or alternative fuel vehicle(s).
  2. Prioritize your agency’s bus routes for electrification based on the information above and your priorities and goals.
  3. Based on your route analysis, describe any adjustments to existing operations that you anticipate are needed to make the project successful (route and schedule adjustments, on-route charging, swapping buses, etc.).

# Phase 2: Goal Setting, ZEV and Electric Vehicle Supply Equipment (EVSE) Procurement, Financial Planning

## Short and Long-Term Transition Goals/Timeline

* 1. Does your agency have short and long-term goals for transitioning the fleet to ZEVs? (If so, please describe below; including any specific milestones).
  2. Do the municipalities and counties your agency services have vehicle electrification goals? (If so, please describe).
  3. Please explain how this plan aligns with the state’s goal of having 1,000 transit ZEVs by 2030 and 100% zero-emission transit vehicles by 2050.

## ZEV Procurement

* 1. Estimate the cost of ZEVs and when your agency plans to purchase them. Use the [Transit ZEV Roadmap Financial Analysis tool](https://www.codot.gov/programs/innovativemobility/electrification/planning-initiatives-and-documents) to estimate costs and purchasing timelines if necessary. Fill out the table below to the best of your ability. It is okay to answer “I don’t know” or “TBD.” Add rows to the table as necessary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Vehicle Type** | **Model Year** | **Purchasing Year** | **Number** | **Estimated Cost of Each Vehicle** | **Warranty Expiration Date** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* 1. What year does your agency anticipate to be “fully electric” based on its estimated purchasing timeline?
  2. Describe how the new vehicles' Total Cost of Ownership (TCO) compares to your existing fleet. Use the [Vehicle and Infrastructure Cash-Flow Evaluation (VICE) Model](https://afdc.energy.gov/vice_model/#:~:text=The%20Vehicle%20and%20Infrastructure%20Cash,battery%20electric%20buses%20(BEB).) developed by the National Renewable Energy Laboratory (NREL) or a similar tool to help calculate the net present value, upfront costs, and payback period.

## EVSE Infrastructure and Facilities Upgrades

* 1. Identify the specific facility names and location(s) at which electric vehicles will charge and be stored. For each facility, describe the required equipment and infrastructure needs for this project and the timeline for installation, including the type, power level, number of charging units/fuel dispensers, and any electrical infrastructure upgrades (such as new transformers). Use the [Transit ZEV Roadmap Financial Analysis tool](https://www.codot.gov/programs/innovativemobility/electrification/planning-initiatives-and-documents) to estimate EVSE costs and purchasing timelines if necessary. Fill out the table to the best of your ability. It is okay to answer “I don’t know” or “TBD.” Add rows to the table as necessary.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Facility Name** | **Address** | **Facility Type** | **Charger Type (Plug-in, inductive)** | **Charger Power Level and Output** | **Number of Charging Units** | **Potential Electrical Infrastructure Upgrades** | **Estimated Cost** | **Estimated Construction Timeline** | **Utility** |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

* 1. What is your plan to expand electric vehicle charging infrastructure as your electric fleet grows?

## Financial Planning

* 1. How will your agency fund the upfront investments required to integrate these vehicles into your fleet?
  2. Have you researched federal, state, or private funding opportunities to assist in financing the transition? If so, which sources seem best suited for your agency?

Fill out the table below with the agency’s plan to finance the ZEV transition. It's okay to write “I don’t know” or “TBD.” Add rows to the table as necessary.

|  |  |  |  |
| --- | --- | --- | --- |
| **Application Year** | **Funding Source** | **Planned Usage of Funds** | **Estimated Amount** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

* 1. Describe how your planned fleet transition will impact your agency’s finances in the short-, medium-, and long-term.
  2. Describe the projected changes in your agency’s budgets due to this transition, including long-term shifts in operating vs. capital budgets. How is your agency preparing for these shifts?
  3. What roadblocks are there to leveraging alternative financing, and how can you address them?

# Phase 3: Stakeholder Engagement and Equitable Deployment Plans

## 1. Stakeholder Involvement

1. To the best of your knowledge, please rate the level of buy-in (very low, low, medium, high, very high, or I don’t know) for transitioning to a ZEV fleet among the following groups within your organization:
   1. Board -
   2. Executive Director/Leadership -
   3. Planning Staff -
   4. Maintenance Staff -
   5. Drivers -
2. To the best of your knowledge, please rate the level of buy-in (very low, low, medium, high, very high, or I don’t know) for transitioning to a ZEV fleet amongst the community your agency services:
   1. Local Elected Officials -
   2. Local Municipality Staffs -
   3. County Staffs -
   4. Business Community -
   5. Tourism and Hospitality Community -
   6. Non-profits, environmental and community organizations -
   7. Transit Riders -
3. Describe your agency’s past and future planned efforts to build long-term institutional support for this effort.
4. Describe your agency’s past and future planned efforts to build long-term public support for this effort.
5. Identify any specific public, private, or institutional champions supporting your fleet transition. Describe their role and contributions to this effort. Add rows to the table as necessary.

|  |  |
| --- | --- |
| **Stakeholder(s)** | **Role/Contribution** |
|  |  |
|  |  |
|  |  |
|  |  |

## Plans for Equitable Deployment

It is important to consider equity throughout the entire ZEV transition planning process. Disproportionately impacted (DI) communities are often in areas with poor air quality and stand to gain the most from a ZEV transition. To ensure the needs of DI communities are met, your agency should create an iterative equitable deployment plan.

* 1. Do you collect demographic data about ridership? If so, what specific data do you collect? (i.e. what populations does your transit service primarily serve?)
  2. How will your agency ensure that the ZEV planning process engages riders from various geographic communities, economic backgrounds, and ethnicities?
  3. Because the entire fleet won’t become electric all at once, your agency will need to decide which routes are electrified first, which by extension will partially determine which populations experience the benefits of ZEVs first. How will you ensure that the benefits of your fleet transition are distributed equitably?
     1. What data will you collect in the process? How will this data be used to inform future operations and subsequent deployments?
  4. Does your agency have a plan for outreach and ZEV education to disadvantaged and/or non-English speaking populations?

# Phase 4: Charge Management and Workforce Development

## Charge Management

Creating a charge management plan is essential to ensure the efficient use of your electric transit vehicles. A charge management plan will optimize vehicle charging, reduce costs, and minimize confusion during the transition period.

1. Describe your anticipated charging schedule for the electric vehicles and any potential impacts on your existing route service. It's okay to write “I don’t know” or “TBD.” Add rows to the table as necessary.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Charging Facility** | **Number and Power Level of Chargers** | **Number of ZEVs Using Facility** | **Anticipated Number of Vehicles Charging Simultaneously** | **Anticipated Service Impacts** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. How does your agency plan to monitor and adjust its charge management plan and infrastructure over time? (Example: upgrading charging stations)
   1. At what point in your overall plan will on-route charging be considered?
2. Who will be responsible for charging the vehicles? (drivers, technicians, etc.)
3. What do you estimate will be the average monthly (total and per mile) electricity costs (including demand charges) for phase 1 of deployment?
   1. Other phases?

## ZEV Workforce Training

While functionally similar to traditional vehicles, ZEVs will require new skills and training to operate and maintain. It is important to have a plan to train your employees.

* 1. Identify the skills, training, and credentials required to maintain and operate the proposed fleet and associated infrastructure. Identify the estimated number and percentage of workers who this transition may impact due to new skills requirements. Assess and identify any current or anticipated gaps between the necessary workforce skills identified above and the current workforce's existing baseline skills/credential requirements. It is okay if you do not have all the answers yet. Add rows to the table as necessary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Employee Type (i.e, technician, driver)** | **Number or Percentage of Employees** | **New Skills Needed** | **New Training Needed** | **New Credentials Needed** | **Current or Anticipated Skill Gaps** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* 1. Describe how your agency will assess the skills of existing employees.
  2. How will you train employees to meet the new skill requirements? Training plans may include in-house training, "train the trainer," registered apprenticeship, third-party training, etc. Identify any additional staff that will need to be recruited and hired.
  3. What steps will your agency take to prevent displacement of the existing workforce?
     1. To demonstrate steps to avoid displacement, explain how your agency will engage current workers in developing ZEV transition strategies and how they will be consulted in finalizing any plans and training to meet the needs of this transition.
  4. Identify how training needs will be funded.
  5. What are potential barriers to implementing a training plan?

# Other Considerations

1. What are potential barriers to implementing a ZEV transition in your fleet?
   1. How do you plan to mitigate or avoid those challenges?
2. What outcome from an early deployment would lead you to abandon/rethink this transition?
3. What outcome from an early deployment would lead you to accelerate this transition?
4. What specific data, metrics, or other results will you use to measure the success of this project?
   1. How will the collected data inform your long-term ZEV plan?