

June 30, 2023

County of Hawaii FY23-24 Notice to Providers of Professional Services

TA.8 Community Planning (Public
Transit Implementation Support)

Submitted by:

Center for Transportation and the Environment





COVER LETTER

June 30, 2023

Mass Transit Agency
County of Hawai'i Mass Transit Agency
25 Aupuni Street
Hilo, Hawai'i 96720

To Whom it May Concern:

The Center for Transportation and the Environment (CTE) is pleased to provide a Statement of Qualification and Expression of Interest for **TA.2 – 109 – Community Planning (Public Transit Long Range and Strategic Planning)** and **TA.8 Community Planning (Public Transit Zero Emissions Bus Implementation Support)** for services required by the County of Hawai'i Mass Transit Agency during the fiscal year 2023-2024. I believe CTE is uniquely qualified to provide the technical expertise and project management services necessary to assist the County of Hawai'i Mass Transit Agency should it require services related to Public Transit Zero Emissions Bus Implementation Support. CTE is experienced in zero-emission bus (ZEB) deployments both for battery electric and fuel cell electric buses, as well as zero-emission bus transition planning projects. In addition, CTE has experience in Hawai'i, leading both the City and County of Honolulu Low-No project as well as the Hawaii Department of Transportation Statewide Zero-Emissions Bus Pilot Program.

Founded in 1993, CTE is a 501(c)(3) nonprofit with the mission to improve the health of our climate and communities by bringing people together to develop and commercialize clean, efficient, and sustainable transportation technologies. CTE collaborates with federal, state, and local governments; fleets; and vehicle technology manufacturers to advance clean, sustainable, innovative transportation and energy technologies.

Thank you for your consideration of CTE's proposal should you require Public Transit Zero Emissions Bus Implementation Support. If you have any questions, please do not hesitate to contact me (dan@cte.tv or 404-518-2322) or Steve Clermont, Director of Planning and Deployment (steve@cte.tv or 404-606-3498).

Sincerely,

A handwritten signature in blue ink, appearing to read 'Daniel J. Raudebaugh', is written over a light blue circular background.

Daniel J. Raudebaugh
Executive Director
730 Peachtree Street NE, Suite 450

Atlanta, GA 30308

1. FIRM DETAILS

The name of the firm or person

Center for Transportation and the Environment

Contact information including email address

Primary Contact: Stephen J. Clermont
404-606-3498
steve@cte.tv

Principal place of business and location of all offices

Principal Office: Center for Transportation & the Environment
730 Peachtree Street
Suite 450
Atlanta, GA 30308

Other CTE offices: Berkeley, CA
Los Angeles, CA
St. Paul, MN

2. AGE OF THE FIRM AND AVERAGE NUMBER OF EMPLOYEES

Age of the firm: 30 years

Average number of employees over the last five years: 50

3. EDUCATION, TRAINING, AND QUALIFICATIONS

CTE's Key Employees have the education, training, qualifications, and experience needed to execute the professional services for the County of Hawai'i Mass Transit Agency associated with TA.8) Community Planning (Public Transit Zero Emissions Bus Implementation Support).

Stephen J. Clermont

Director of Planning and Deployment

B.S. Industrial Management, Georgia Institute of Technology

M.S. Management, Georgia Institute of Technology

Mr. Clermont has more than 29 years of experience in sustainability, advanced and alternative transportation technology, information technology, accounting, and financial management consulting, including information systems management, business process and organizational strategy, as well as enterprise systems software design, development and implementation. Mr. Clermont has successfully managed battery electric bus assessment, procurement and deployment projects at more than a dozen transit agencies across the country.

Daniel J. Raudebaugh

Executive Director

B.S. Mechanical Engineering, Georgia Institute of Technology

As Executive Director for CTE, Mr. Raudebaugh has dedicated the last 29 years to fostering environmental and energy sustainability and creating jobs within US emerging technology sectors. In his role as Executive Director, Mr. Raudebaugh has the opportunity to interact with all of CTE's clients and provides oversight to ensure projects are successfully implemented. Mr. Raudebaugh joined CTE in 1994 and was named Executive Director in 2001.

Erik Bigelow

Senior Project Manager

B.S. Mechanical Engineering, The University of Texas at Austin

Erik Bigelow is the Director of CTE's Engineering group and provides project and engineering oversight for many of CTE's projects. Mr. Bigelow has worked on zero-emission bus development and deployment projects since starting with CTE in 2009. His experience spans prototype vehicle development and bus deployment, as well as battery electric and hydrogen drive systems, and charging infrastructure planning and analysis. Mr. Bigelow has more than 14 years of direct experience in zero-emission bus analysis and program management with a wide variety of transit agencies in varied size and climates. He also provides decision support for charging needs, vehicle selection, route feasibility and transition planning for fleets with existing and prior projects in over 25 states.

Jason Hanlin

Director of Technology Development

B.S. Mechanical Engineering, University of Tennessee

M.S. Mechanical Engineering, Georgia Institute of Technology

Mr. Hanlin is responsible for the organization, development, management, and promotion of technical projects and programs. These projects involve development of all electric and fuel cell vehicles and associated fueling or charging infrastructure. During his 20+ year professional career, Mr. Hanlin has been responsible for the initiations and successful management of over \$80 million in advanced technology projects for private, federal, and state sponsors.

Jaimie Levin

Senior Project Manager

B.A. Urban Affairs, University of Wisconsin

Masters in City Planning, University of California, Berkeley

Mr. Levin has secured more than \$100 million in funding to support the deployment of medium- and heavy-duty fuel cell electric vehicles and hydrogen fueling infrastructure since joining CTE. He prepared another winning proposal for a project he later managed to completion, receiving grants from CARB and local Air Districts to deploy 20 next-generation fuel cell electric buses and supporting fueling infrastructure at Orange County Transportation Authority (CA) and AC Transit (CA). Mr. Levin is currently overseeing fuel cell transit projects at Champaign-Urbana Mass Transit District (IL), Golden Empire Transit District (CA), and Foothill Transit (CA).

Kylie McCord

Senior Engineering Consultant
B.S. Civil Engineering, Georgia Institute of Technology
Master of Business Administration, Georgia State University

Mr. McCord has nearly 25 years of experience in project management including zero-emission bus deployment and transition planning, construction management, and client service management. Mr. McCord has a State of Hawaii Professional Engineer license and is currently working as the Senior Project Manager for the Hawaii Department of Transportation's Hawaii Statewide Zero Emission Bus Program Project that CTE has been managing since 2021. Mr. McCord has served as the Zero-Emission Bus Assessment Team Lead for Zero-Emission Bus transition planning projects including San Diego Metropolitan Transit System (CA), Spokane Transit Authority (WA), King County Metro (WA), Missoula Urban Transportation District (MT), and City of Fort Collins (CO). In addition, Mr. McCord serves as a Project Manager and Senior Engineer for multiple zero-emission bus deployment projects including Port Arthur Transit (TX), Greater Bridgeport Transit (CT), Montgomery County Transit (MD), and Massachusetts Bay Transportation Authority (MA).

Savannah Gupton

Senior Managing Consultant
B.S. Zoology, North Carolina State University
M.A. Conservation Biology, Miami University

Ms. Gupton provides organizational, technical, and developmental oversight for projects that deploy both fuel cell electric vehicles and battery-electric vehicles and the related fueling/charging infrastructure as a project manager. She is engaged in zero-emission bus deployments for the City of Las Cruces (NM), Stockton Unified School District (CA), and North Central Regional Transit District (NM). She has successfully deployed fuel cell buses and hydrogen refueling infrastructure at Orange County Transportation Authority (CA) and Alameda-Contra Costa Transit District (CA). In addition to active deployments, she has worked on zero-emission bus transition plans and projections for Long Beach Transit (CA), Livermore-Amador Transit Authority (CA), Butte County Association of Governments (CA), Riverside County Transportation Commission (CA) and Riverside County transit operators (CA), Stockton Unified School District (CA), and Central Contra Cost Transit Authority (CA) for compliance with the California Air Resources Board's Innovative Clean Transit Regulation.

Jay Woodbeck

Engineering Service Manager
B.S. Mechanical Engineering, Michigan Technological University
M.S. Energy Systems Engineering, University of Michigan

Mr. Woodbeck leads CTE's team of engineers to provide technical analysis and insight for advanced transportation projects, including battery-electric and hydrogen fuel cell power vehicles. In his previous role at CTE as an Engineering Consultant, he specialized in route analysis to optimize zero-emission fleet miles, working with transit agencies for custom fleet transition plans, and providing utility analysis. He provided technical analysis to weigh using battery-electric, hydrogen fuel cell, or a mixture of both technologies in full fleet transition plans for RTC

Southern Nevada (NV) and Corpus Christi Regional Transportation Authority (TX). For agencies looking at battery-electric fleets, he provided feasibility analysis and projected costs of fleet transitions for the AppalCART (NC), and Hoke Area Transit Service (NC). Mr. Woodbeck has led a statewide transition planning data analysis for the Virginia Department of Rail and Public Transportation, developed a charging management optimization tool for Laketrans (OH), and contributed to route and charging analysis for Delaware Transit Corp (DE) and Quad Cities MetroLink (IL). His previous experience includes electrified vehicle testing, project management, and EV education at an automotive OEM. Mr. Woodbeck is knowledgeable about AC, DC, and wireless charging operation, standards, infrastructure, and smart grid integration.

Aydin Manouchehri

Engineering Consultant

B.S. Mechanical Engineering, University of California Irvine

Mr. Manouchehri has more than 16 years of experience in the field of engineering and project management, 11 years of which have been dedicated to the alternative energy industry, with six exclusively in hydrogen fueling infrastructure. In his previous role, he led design, engineering, permitting, and construction efforts on more than 20 hydrogen fueling facilities. These include the first heavy-duty public access hydrogen stations in America. Mr. Manouchehri has unique experience in permitting and public outreach, including jurisdictions with distinctive challenges including the cities of San Francisco, San Jose, Los Angeles, Palo Alto, and the Port of Long Beach. Most recently, he led the engineering and design effort for the migration to hydrogen powered buses for Champagne-Urbana Mass Transit District (IL).

Maggie Maddrey

Managing Consultant

B.S. Environmental Science, Berry College

Mrs. Maddrey is responsible for the management of a number of CTE's battery electric bus demonstration and ZEB transition plan projects. In this role, Mrs. Maddrey is responsible for leading all aspects of project management including budgeting and contract management, project planning, client contact, and required project reporting. Project clients include: Santa Cruz Metropolitan District (CA), Delaware Transit Corporation (DE), City of Columbia (MO), Hawaii Department of Transportation (HI), CyRide (IA), Albuquerque International Sunport (NM), and Central Oregon Public Transit (OR).

Niki Rinaldi El-Abd

Managing Consultant

B.S. Environmental Studies, University of California Santa Barbara

M.S. Sustainable Resource Management, Technical University of Munich

Ms. Rinaldi El-Abd provides organizational and technical support for advanced transportation projects, including battery electric and hydrogen fuel cell powered vehicles as a project manager. She manages zero-emission bus deployment projects, oversees modeling for transition plans and projections for compliance with the California Air Resources Board's Innovative Clean Transit Regulation, and oversees the maintenance of CTE's transition planning resources and modeling materials. Ms. Rinaldi El-Abd coordinated and taught CTE's ZEB 101

course at the 2022 Zero Emission Bus Conference, which helped to engage and educate transit agencies about the current state of ZEB technology.

4. LIST OF RECENT PROJECTS AND CLIENT REFERENCES

Smart Deployments		Transition Plans
Alameda-Contra Costa Transit District	Greater Portland Transit District	Albuquerque Ride
Atlanta-Region Transit Link Authority	Hawaii Department of Transportation	Berkshire Regional Transit Authority
Atlanta Public Schools	Intercity Transit	Butte County Association of Governments
Biddeford, Saco, Old Orchard Beach Transit	Jacksonville Transit Authority	Cascades East Transit
Broome County	Kansas City Area Transportation Authority	City of Albuquerque, NM
Broward County Transit Fleet	Lake County Regional Transit Authority	City of Alexandria, VA
Capital Metropolitan Transit Authority	Lane Transit District	City of Commerce, CA
Capital District Transportation Authority	Lawrence Transit	City of Decatur
Champaign-Urbana Mass Transit District	Long Beach Transit	City of Fort Collins, CO
Cobb County Transit	Mass Transportation Authority Flint	City of Glendale, CA
Connecticut Transit	MetroLINK	Corpus Christi Regional Transportation Authority
Central Contra Costa Transit Authority	Metropolitan Atlanta Rapid Transit Authority	County of Hawaii Mass Transit Agency
Central Florida Regional Transportation Authority	Metropolitan Saint Louis Transit Agency	Delaware Transit Corporation
The Central Midlands Regional Transit Authority	Minnesota Department of Transportation	Fairfax County Department of Transportation
Davenport CitiBus	Missoula Urban Transportation District	Intercity Transit
City and County of Honolulu	Mountain Line	King County Metro
City of Albuquerque, NM	North Central Regional Transit District	Kitsap Transit
City of Corvallis, OR	Napa Valley Transportation Authority	Livermore Amador Valley Transit Authority
City of Fort Collins, CO	Pinellas Suncoast Transit Authority	Long Beach Transit
City of Gainesville, FL	Prince George's County, MD	Los Angeles County Metropolitan Transportation Authority
City of Las Cruces, NM	Rockford Mass Transit District	Montgomery County Department of Transportation
City of Madison Metro Transit	Salem Area Mass Transit District	New Jersey Transit
City of Santa Monica	Santa Cruz Mass Transit District	Regional Transportation Commission of Southern Nevada
Community Transit	San Diego MTS	Riverside County Transportation Commission
Culver CityBus	Shasta Regional Transportation	San Mateo County Transit District
CyRide	South Metro Area Regional Transit	Solano County Transit
Denver Regional Transportation District	SouthWest Transit	
	Spokane Transit Authority	
	SporTran Transit	

<p>Delaware Transit Corporation Fayetteville Area System of Transit Foothill Transit Gainesville Regional Transit System Georgia State Road & Tollway Authority Go COMO – Columbia Transit Gold Coast Transit Gold Empire Transit District Greater Bridgeport Transit</p>	<p>Tri-County Metropolitan Transportation District of Oregon Utah Transit Authority Valley Regional Transit VIA Metropolitan Transit Winnipeg Transit Washington Metropolitan Area Transit Authority Worcester Regional Transit Authority</p>	<p>Spokane Transit Authority Tri-County Metropolitan Transportation District of Oregon University of California, Santa Cruz Utah Transit Authority Washington Gas Light</p>
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Additional information about the project references below is included in the attached Descriptive Literature.

Project Name: San Diego MTS Zero-Emission Bus Pilot Program	
Agency: San Diego Metropolitan Transit System	Contact: Michael Wygant, COO Ph: (619) 238-0100 x6400 Email: Michael.Wygant@sdmts.com
Project Duration: April 2018 – June 2020 Pilot August 2022	

Project Name: Honolulu Zero-Emission Fleet Transition Project	
Agency: City and County of Honolulu Department of Transportation Services	Contact: Howard Chee Ph: (808) 768-8329 Email: hchee@honolulu.gov
Project Duration: February 2018 – March 2023	

Project Name: MTD Hydrogen Fuel Cell Electric Buses	
Agency: Champaign-Urbana Mass Transit District	Contact: Karl Gnadt, Managing Director/CEO Ph: (217) 384-8188 Email: kgnadt@mtd.org
Project Duration: April 2018 – July 2023	

Project Name: GBT Zero-Emission Fleet Transition Project	
Agency: Greater Bridgeport Transit and Connecticut Department of Transportation	Contact: Doug Holcomb, CEO Ph: (203) 366-7070 x124 Email: DHolcomb@gogbt.com
Project Duration: April 2018 – July 2023	

Project Name: Spokane Transit Authority Transition Plan, RFP Development, & Validation Services	
Agency: Spokane Transit Authority	Contact: Angie Fitchner, Technical Projects Manager Ph: (509) 344-1875 Email: afitchner@spokanetransit.com
Project Duration: August 2018 – June 2023	

5. DESCRIPTIVE LITERATURE

CTE's qualifications and project descriptions for references are included in this section.

Zero- Emission Bus Deployment Qualifications



The **Center for Transportation and the Environment (CTE)** is a 501(c)(3) nonprofit with the mission to improve the health of our climate and communities by bringing people together to develop and commercialize clean, efficient, and sustainable transportation technologies. CTE collaborates with federal, state, and local governments; fleets; and vehicle technology manufacturers to advance clean, sustainable, innovative transportation and energy technologies. Since its founding in 1993, CTE has managed a portfolio of more than \$1.1 billion in research, development, demonstration, planning, and deployment projects funded by federal and state organizations including the U.S. Departments of Transportation, Energy, Defense, and Interior, as well as the California Air Resources Board and California Energy Commission.

Experience

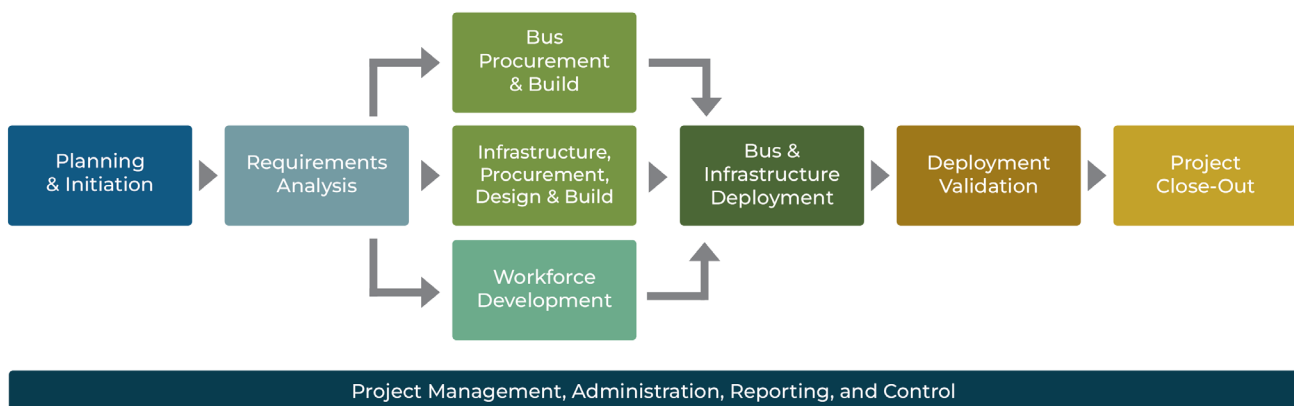
CTE is the national leader in providing technical assistance for zero-emission bus (ZEB) deployments, guiding transit agencies through battery-electric and fuel cell electric bus deployment projects while minimizing project risks. The unique operating characteristics and fueling requirements of these deployments may present challenges for transit agencies who are accustomed to operating conventionally fueled vehicles. Regardless of an agency's familiarity with zero-emission buses, CTE can provide the expertise necessary to help agencies mitigate risks associated with these deployments. CTE understands both the technical and administrative challenges associated with the procurement, deployment, and operation of zero-emission vehicles.

For more than a decade, CTE has managed a range of zero-emission bus projects from new bus development and demonstration projects to full fleet deployment and transition planning projects. This portfolio includes projects made possible through the Federal Transit Administration's (FTA) Low or No Emission Vehicle Program, TIGGER Program, Clean Fuels Program, and the National Fuel Cell Bus Program. Through these and other programs, CTE has provided technical and management support or transition planning assistance to more than 100 transit agencies. Transit agencies supported by CTE's Smart Deployment service have either deployed or will soon deploy more than 700 zero-emission buses.

Approach

Smart Deployment Methodology

Based on this experience, CTE developed a Zero-Emission Bus Smart Deployment Methodology to assist transit agencies in their zero-emission bus deployments. The cornerstone of CTE's approach is to apply our modeling and analysis tools to match transit service requirements with the right ZEB technologies and operational strategies. CTE's approach equips agency staff with a robust understanding of the ZEB market and technology options as well as the impact that these options have on operational strategies and related costs.



Services

CTE has created a suite of services based on our Zero-Emission Bus Smart Deployment Methodology, which are specifically designed to help agencies understand ZEB technologies and how to successfully deploy them. Based on our success with previous deployment projects, CTE offers several project and technical consulting service packages designed to fit a variety of client requirements. Each service package consists of a combination of tasks from the full list of services in CTE's Zero-Emission Bus Smart Deployment Methodology:

- ▶ Project Planning
- ▶ Route, Bus, Charge, and Rate Modeling
- ▶ Bus & Fueling Advisory
- ▶ Procurement Support & Technical Evaluation
- ▶ Performance Validation
- ▶ Benefits Assessment & Deployment Validation
- ▶ Project Management & Technical Advisory

Industry Involvement

CTE is an active participant in industry-led initiatives, representing the organization's diverse relationships with industry stakeholders:

- ▶ American Public Transportation Association's (APTA) Zero Emission Bus Standard Bus Procurement Guidelines Development Committee
- ▶ CTE staff authored two reports for the Transportation Research Board's Transit Cooperative Research Program (TCRP): *Electric Battery Buses – State of Practice* and *Guidebook for Deploying Zero-Emission Transit Buses*
- ▶ CTE staff authored two white papers and a guidebook for the National Center for Applied Transit Technology (N-CATT): *Building Successful Partnerships between Rural Transit Systems Deploying Zero-Emission Vehicles and their Electric Utilities*, *Hydrogen as a Transportation Fuel in Rural Communities*, and *Guide to Green Energy Adoption for Transit Agencies*

CTE is also leading the ZEB industry with a number of outreach initiatives designed to educate stakeholders, support collaboration, and advance the state of the technology to best serve the needs of transit agencies across the country:

- ▶ **Zero Emission Bus Resource Alliance (ZEBRA)**
CTE provides technical assistance and industry consultation
- ▶ **International Zero Emission Bus Conference**
CTE hosts and organizes the event each year, gathering industry leaders from around the world
- ▶ **FTA's Transit Vehicle Innovation Deployment Centers (TVIDC)**
In coordination with FTA's Office of Research, Demonstration, and Innovation, CTE leads multiple research efforts designed to facilitate the transit industry's transition to zero-emission buses



MTD Hydrogen Fuel Cell Electric Buses

Champaign-Urbana Mass Transit District (MTD) Urbana, Illinois



Contact		Key Personnel	
Karl Gnadt <i>Managing Director</i>		Jaimie Levin <i>Senior Project Manager</i>	
1101 E. University Ave., Urbana, IL 61802 (217) 384-8188 kgnadt@mtd.org		Alison Smyth <i>Lead Engineering Consultant</i>	
		Yeshasvi Mahadev <i>Lead Engineering Associate</i>	
		Shannon Russell <i>Managing Associate</i>	
Project Duration	Project Value	CTE Project Value	
April 2018 – June. 2023	\$14,264,800	\$552,467	

Project Description

The Center for Transportation and the Environment (CTE) partnered with Champaign-Urbana Mass Transit District (MTD) for a successful award under the 2017 Federal Transit Administration’s (FTA) Low or No Emission Vehicle Program (Low-No). CTE worked with MTD to deploy two 60’ fuel cell electric buses (FCEBs), retrofit the maintenance facility to accommodate hydrogen-powered vehicles, and construct a fueling station that includes a 1 MW electrolyzer for on-site production. These buses are the first commercial articulated FCEBs in the United States.

At the start of the project, CTE worked with MTD to establish a project management plan that summarized tasks and deliverables for the project’s full timeline, including vehicle procurement and station construction. CTE provided project management support throughout the deployment.

From a technical support standpoint, CTE assisted MTD with developing a contract for the buses, including the vehicle specifications. CTE also drafted the RFP for the fueling station and participated in the evaluation process for the proposals, which resulted in MTD selecting Trillium to design and build the hydrogen fueling station. Trillium will also perform operations and maintenance services for MTD. During manufacturing, CTE also oversaw quality control inspections for the vehicles.

To date, both FCEBs have been delivered to MTD, the maintenance facility upgrade is complete, the fueling station is commissioned, and the buses have been placed into revenue service. CTE has provided eight months of Key Performance Indicator (KPI) data reporting services using a dashboard created specifically for this project as well data training and resources to MTD staff.

MTD implemented a solar array at their station that went online in October 2022. Trillium is actively working to utilize solar as much as possible in order to draw the least amount of power from the grid and CTE is providing support and assistance to the project team to minimize costs associated with on-site hydrogen production.



Honolulu Zero-Emission Fleet Transition Project

Age City and County of Honolulu Department of Transportation Services (DTS) and Oahu Transit Services (OTS)



Contact Howard Chee City & County of Honolulu Frank F. Fasi Municipal Building 650 South Kind Street, 3rd Floor, Honolulu, Hawaii 96813 hchee@honolulu.gov		Key Personnel Steve Clermont <i>Senior Project Manager</i> Emily Price <i>Project Manager</i> Matt Boothe <i>Engineering Consultant</i> Chase Stell <i>Managing Associate</i>
Project Duration Feb. 2018 – March 2023	Project Value \$1,4500,000	CTE Project Value \$513,344

Project Description

The Center for Transportation and the Environment (CTE) partnered with the City and County of Honolulu Department of Transportation Services (DTS) and Oahu Transit Services (OTS) for a successful award under the 2017 FTA Low or No Emissions Program (Low-No). CTE is managing the project and providing technical assistance as OTS deploys three GILLIG 40’ battery-electric buses (BEB).

CTE is providing technical support and project management services to DTS in support of the zero-emission bus project. CTE has managed the entire deployment including coordinating regular meetings and information sharing, tracking project tasks, risks, budget and timeline, and preparing quarterly reporting required by FTA.

DTS also partnered with the Department of Design and Construction (DDC) and Hawaiian Electric Company (HECO) to construct the charging infrastructure. The charging infrastructure is installed in the Ready Line area and includes nine 150 kW chargers with 25 remote dispensers.

DTS received delivery of the GILLIG BEBs in the last quarter of 2021. In the beginning of 2022, the ready line charging station came online and in March 2022 DTS put the buses into revenue service.

Since the buses have been deployed, CTE began to collect, analyze, and report on key performance indicators (KPIs). These KPIs help DTS and OTS track and understand the performance of the BEBs for 12 months following deployment. Following the data collection period, CTE created and submitted a final report to FTA, summarizing the project and results.



GBT Zero-Emission Fleet Transition Project

Greater Bridgeport Transit (GBT) and Connecticut Department of Transportation (CTDOT)



<p>Contact</p> <p>Doug Holcomb <i>CEO</i></p> <p>Greater Bridgeport Transit One Cross St. Bridgeport, CT 06610 (203) 366-7070 x124 DHolcomb@gogbt.com</p>	<p>Key Personnel</p> <p>Kylie McCord, <i>Project Manager</i> Anna Staddon, <i>Managing Associate</i></p>	
<p>Project Duration</p> <p>May 2018 – December 2023</p>	<p>Project Value</p> <p>\$1,450,000</p>	<p>CTE Project Value</p> <p>\$475,000</p>

Project Description

The Center for Transportation and the Environment (CTE) has partnered with Greater Bridgeport Transit (GBT) and the Connecticut Department of Transportation (CTDOT) for a successful award under the FTA Low or No Emission Program (Low-No). CTE is providing project management and technical assistance as GBT deploys five 40’ Proterra battery electric buses (BEBs). Technical assistance for the project includes bus and route modeling for several different vehicle configurations and routes (including evaluating the need for auxiliary heat), support during technical specification development for vehicles and chargers, coordination with GBT’s engineering consultant regarding electrical and charging system design and safety review, completion of Buy America audits, and periodic quality inspections during bus fabrication. CTE has also supported GBT in multiple community and legislative outreach activities throughout the project.

The project was split into two separate phases due to delays associated with completion of Altoona testing for the Proterra 40’ 660 kWh ZX-5 bus. GBT elected to purchase two 40’ Proterra Catalyst E2 440 kWh buses and installed two depot chargers to gain insight into impacts on training, maintenance, and operations, prior to deploying the three longer range 660 kWh vehicles during the second phase. The first two vehicles entered revenue service in January 2021. CTE helped GBT monitor the in-service buses by providing bi-weekly reports of performance and quarterly key performance indicator (KPI) reports. However, as of July 2022, revenue service and CTE’s reporting services have been paused to allow for the investigation of a Connecticut Transit (CT Transit) bus fire to conclude. Currently, CTE is finalizing an interim final report reflecting activities completed during the first phase of the project and preparing for Phase II.

CTE and GBT are working together with Wendel, GBT’s engineering consultant, and United Illuminating, the local electrical utility, to complete planning for the installation of the remaining chargers to support deployment of the three Proterra 660 kWh ZX-5 vehicles. GBT has received the three Proterra buses and is currently completing driver training and planning for installation of the new chargers. CTE will continue to provide the full scope of services to GBT during the second phase of the project. Additionally, CTDOT and CT Transit technical staff have participated in all-team activities (e.g., goal setting, model result review, etc.) in an effort to further their knowledge of battery electric bus deployments and to translate this into future efforts by CTDOT and CT Transit.



Spokane Transit Authority Transition Plan, RFP Development, & Validation Services

Spokane Transit Authority



<p>Contact</p> <p>Angie Fitchner <i>Technical Projects Manager</i></p> <p>1230 West Boone Ave., Spokane, WA 99201 (509) 344-1875 afitchner@spokanetransit.com</p>	<p>Key Personnel</p> <p>Kylie McCord <i>Senior Project Manager</i></p> <p>Matt Boothe <i>Senior Engineering Consultant</i></p> <p>Taylor Baldwin <i>Engineering Consultant</i></p>
<p>Project Duration</p> <p>Aug. 2018 – June 2023</p>	<p>CTE Project Value</p> <p>\$392,086</p>

Project Description

The Center for Transportation and the Environment (CTE) led a team to support Spokane Transit Authority’s (STA) Analysis of Alternatives for Fleet Conversion to Zero-Emission Technologies. CTE applied its standard transition planning methodology to this analysis and identified lifecycle costs, performance issues, risks, and recommended timeline for the deployment of ZEBs throughout STA’s entire fleet and on the HPT lines. While the analysis encompassed STA’s entire fixed-route service, considering a transition over an extended period of time, part of the analysis specifically focused on two high performance transit (HPT) lines in consideration of near-term zero-emission bus (ZEB) adoption. The analysis considered financial and operational impacts of commercially available battery electric transit bus technologies. The results of this analysis were presented to STA’s Board of Directors to better inform decision making on the transition to a zero-emission bus fleet and the results will also inform STA decision-making in the areas of policy, procurement, and technology.

CTE collected data and simulated battery electric bus operations on a representative sample of STA routes to determine operating efficiencies under various loading conditions for each STA route category and then applied this information to STA’s current and proposed blocking schedules to estimate total daily energy requirements across the fleet. This effort also included bus, route, and charge modeling for the HPT lines. CTE drafted requirements for buses and charging infrastructure using the outputs from the modeling and simulation efforts. Bus requirements focused on energy storage required to meet STA service while charging requirements identified charge rates, daily demand, and daily energy requirements for the HPT routes and the entire fleet.

CTE worked with project partner WSP to develop conceptual charging layouts and rough-order-magnitude infrastructure costs for the transition. Using this data, CTE created a transition plan for the replacement of STA’s current fleet to zero-emission and identified the number of standard diesel transit buses that could be replaced by ZEBs based on particular vehicle capability in the context of the transition timeline. The transition plan included a lifecycle cost analysis for the baseline (diesel) and battery electric bus scenarios over the timeline. CTE also developed a charging model to evaluate different charging scenarios, including the use of high-capacity charging at the depot and on-route charging, to determine the total load by time of



San Diego MTS Zero-Emission Bus Pilot Program

San Diego Metropolitan Transit System



Contact		Key Personnel	
Michael Wygant <i>COO</i> Transit Services 1255 Imperial Ave., Ste. 1000 San Diego, CA 92101 (619) 238-0100 x6400 Michael.Wygant@sdmts.com		Steve Clermont <i>Senior Project Manager</i> Kylie McCord <i>Project Manager</i> Christian DiCenso <i>Engineering Consultant</i>	
Project Duration	Project Value	CTE Project Value	
April 2018 – June 2020 November 2022 (Pilot)	\$553,728	\$435,148	

Project Description

The Center for Transportation and the Environment (CTE) led the San Diego Metropolitan Transit System (MTS) Zero-Emission Bus (ZEB) Pilot Program, which included a ZEB feasibility assessment, a ZEB transition plan, and a ZEB pilot. For the feasibility assessment, CTE analyzed routes and service requirements to determine how ZEBs may be best used in MTS service. The feasibility assessment also included analysis of MTS facilities to determine how they could accommodate charging infrastructure and/or hydrogen fueling infrastructure.

CTE analyzed routes and service requirements to determine how ZEBs may be best used in MTS service as part of the feasibility assessment. CTE utilized its ZEB Transition Planning Methodology to guide creation of MTS’s ZEB transition plan. Key activities CTE led to develop the transition plan included conducting a ZEB market analysis, data collection, assessing energy requirements through modeling and simulation, defining necessary facility upgrades, and developing a transition timeline and cost/benefit model. CTE employed its ZEB smart deployment methodology to support MTS’s efforts to deploy six battery electric zero-emission buses as part of the agency’s pilot program.

CTE worked with MTS to finalize recommendations, support community outreach, and complete an implementation strategy. The final study and associated recommendations were approved by the MTS Board of Directors in September 2020 and by the California Air Resources Board (CARB) in December 2020.

The ZEB transition plan defined a series of ZEB and infrastructure projects to transition to a 100% zero-emission fleet and provided estimates of capital costs, operating and maintenance costs, and a fleet emissions profile over the transition timeline. Finally, CTE developed a pilot project scope and work plan, and worked with MTS to conduct a two-year evaluation of pilot operations after deployment. Results from the pilot study were compiled in a final report submitted to MTS in November 2022.



day for overnight and daytime charging of battery electric buses based on total daily energy requirements to provide STA transit services. CTE evaluated the estimated electricity costs for different charging options based on the current utility rate structure and a proposed electric vehicle rate structure that is being developed by the utility.

CTE, with help from WSP, supported STA in developing an RFP for battery electric bus charging infrastructure. Transition planning outcomes helped inform the specifications required for the infrastructure as well as the conceptual design presented in the RFP. CTE was responsible for developing the technical specifications of the RFP and also participated on the evaluation team tasked with reviewing RFP responses. Currently, CTE is providing service validation and key performance indicator reporting for the two HPT lines. Validation services were originally scheduled to begin in early 2022 but have been delayed due to construction delays associated with the Bus Rapid Transit infrastructure for the City Line.