# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

BCAG

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING

AUGUST 25, 2022

# Acronyms for Butte County Association of Governments

| ACRONYM | MEANING |
|---|---|
| AB | Assembly Bill |
| ACOE | Army Corps of Engineers |
| AFR | Accident Frequency Ratio |
| APS | Alternative Planning Strategy |
| AQMD | Air Quality Management District |
| ARB | Air Resource Board |
| AVL | Automatic Vehicle Location |
| BCAG | Butte County Association of Governments |
| CALCOG | California Association Council of Governments |
| CARB | California Air Resource Board |
| CEQA | California Environmental Quality Act |
| CMAQ | Congestion Mitigation & Air Quality |
| CON | Construction |
| CTC | California Transportation Commission |
| CTIPS | California Transportation Improvement Program System |
| DFG | California Department of Fish and Game |
| DOT | Department of Transportation |
| EIR | Environmental Impact Report |
| EMFAC | Emissions Factors |
| EPA | Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Administration |
| FTIP | Federal Transportation Improvement Program |
| FY | Fiscal Year |
| GARVEE | Grant Anticipation Revenue Vehicle Program |
| GhG | Greenhouse Gas Emissions |
| GIC | Geographical Information Center |
| GIS | Geographic Information Systems |
| GPS | Global Positional Satellite |
| HCP | Habitat Conservation Plan |
| IIP | Interregional Improvement Program |
| IPG | Intermodal Planning Group |
| ITIP | Interregional Transportation Improvement Program |
| ITS | Intelligent Transportation Systems |
| JPA | Joint Powers Agreement |
| LAFCO | Local Agency Formation Commission |
| LTF | Local Transportation Fund |
| MPO | Metropolitan Planning Organization |
| NAAQS | National Air Quality Standards |
| NCCP | Natural Community Conservation Plan |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service (Also NOAA Fisheries) |
| | |
| | |

| ACRONYM | MEANING |
|---|---|
| NOAA | National Oceanic and Atmospheric Administration Fisheries (Also NMFS) |
| OWP | Overall Work Program |
| PA&ED | Project Appproval & Environmental Document |
| PDT | Project Development Team |
| PEER | Permit Engineering Evaluation Report |
| PL | Federal Planning Funds |
| PPH | Passengers Per Revenue Hour |
| PLH | Public Lands Highway |
| PPM | Planning Programming & Monitoring |
| PPNO | Project Programming Number |
| PS&E | Plans, Specifications & Estimates |
| PSR | Project Study Report |
| PTMISEA | Public Transportation Modernization Improvemant and Service Enhancement Account |
| PUC | Public Utilities Code |
| R/W | Right of Way |
| RFP | Request for Proposals |
| RHNA | Regional Housing Needs Allocation |
| RHNP | Regional Housing Needs Plan |
| RIP | Regional Improvement Program |
| RTAC | Regional Target Advisory Committee |
| RTIP | Regional Transportation Improvement Program |
| RTP | Regional Transportation Plan |
| RTPA | Regional Transportation Planning Agency |
| SACOG | Sacramento Area Council of Governments |
| SAFETEA-LU | Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users |
| SCEA | Sustainable Community Environmental Assessment |
| SCS | Sustainable Community Strategy |
| SDP | Strategic Deployment Plan |
| SHOPP | State Highway Operation Protection Program |
| SSTAC | Social Services Transportation Advisory Council |
| STA | State Transit Assistance |
| STIP | State Transportation Improvement Program |
| TAC | Transportation Advisory Committee |
| TAOC | Transit Administrative Oversight Committee |
| TCRP | Transportation Congestion Relief Program |
| TDA | Transportation Development Act |
| TE | Transportation Enhancements |
| TIP | Transportation Improvement Program |
| TPP | Transit Priority Project |
| TSGP | Transit Security Grant Program |
| USACE | United States Army Corps of Engineers |
| USFWS | United States Fish and Wildlife Service |
| UTN | Unmet Transit Needs |
| WE | Work Element |

# BCAG Board of Directors Meeting

August 25, 2022
9:00 a.m.

## BCAG Board Room

326 Huss Drive, Suite 100
Chico, CA 95928

BCAG BOARD MEETING LIVE

**This meeting of the BCAG Board of Directors will also be available via Zoom through the following Zoom link:**

**Zoom Meeting ID: 819 3543 6576 Password: 966605**
**To join the meeting by phone: +1 669 900 6833**

**Members of the public may attend the meeting in person or via Zoom, public comments may also be sent to: board@bcag.org**

1. Pledge of Allegiance
2. Roll Call

## CONSENT AGENDA

3. Approval of Minutes from the June 23, 2022, BCAG Board of Directors Meeting (Attachment) – **Ashley**
4. Approval of Fiscal Year 2022/23 Preliminary Transportation Development Act (TDA) Claims (Attachment) **– Julie**
5. Approval of Amendment #1 to the 2022/23 BCAG Overall Work Program & Budget (Attachment) – **Julie**
6. Approval of the Project List for the FY 2022/23 California State of Good Repair (SGR) Program (Attachment) - **Sara**
7. Approval of BCAG/B-Line Agency Safety Plan (ASP) Annual Review (Attachment) – **Amy**
8. Approval of Social Services Transportation Advisory Council (SSTAC) Appointments (Attachment) - **Victoria**

## ITEMS REMOVED FROM CONSENT AGENDA – *If Any*

## ITEMS FOR INFORMATION

9. BCAG 2022 Federal Agenda Program (Attachment) – **Jon**
10. B-Line Advertising Update (Attachment) – **Sara**
11. Draft 2023 Federal Transportation Improvement Program (FTIP) (Attachment) – **Ivan**
12. B-Line Mobile App Update (Attachment) – **Amy**

## ITEMS FOR ACTION

13 Adoption of 100% Zero Emissions Bus (ZEB) Rollout Plan to comply with California Air Resource Board (CARB) Innovative Clean Transit (ICT) Regulation (Attachment) – **Andy**

## ITEMS FROM THE FLOOR

14. Members of the public may present items to the BCAG Board of Directors, but no action will be taken other than placement on a future agenda.

## ADJOURNMENT

10. The next meeting of the BCAG Board of Directors has been scheduled for Thursday September 22, 2022, **at the BCAG Board Room & via Zoom.**

*Copies of staff reports or other written documentation relating to items of the business referred to on the agenda are on file at the office of the Butte County Association of Governments (BCAG). Persons with questions concerning agenda items may call BCAG at (530) 809-4616.*

***Any handouts presented by speakers are to be distributed to the Board by the Clerk of the Board.***

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

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# BOARD OF DIRECTORS MEETING ITEM #3

Item #3
Consent

# DRAFT MEETING MINUTES OF THE BUTTE COUNTY ASSOCIATION OF GOVERNMENTS June 23, 2022

The following minutes are a summary of actions taken by the Board of Directors. A digital recording of the actual meeting is available at BCAG's office located at 326 Huss Drive, Suite 150, Chico, CA.

Board Member K. Reynolds called the meeting to order at 9:01 a.m. at the BCAG Board Room, 326 Huss Drive, Suite 100, Chico, CA.

**MEMBERS PRESENT IN PERSON**

| | | |
|---|---|---|
| Kasey Reynolds | Vice Mayor | City of Chico |
| J Angel Calderon | Councilmember | City of Gridley |
| Chuck Nuchols | Councilmember | City of Biggs |
| Tami Ritter | Supervisor | District 3 |
| Doug Teeter | Supervisor | District 5 |
| Bill Connelly | Supervisor | District 1 |
| Rose Tyron | Councilmember | Town of Paradise |

**MEMBERS PRESENT REMOTELY**

| | | |
|---|---|---|
| Debra Lucero | Supervisor | District 2 |

**MEMBERS ABSENT**

| | | |
|---|---|---|
| Jody Jones | Councilmember | Town of Paradise |
| Tod Kimmelshue | Supervisor | District 4 |
| Chuck Reynolds | Mayor | City of Oroville |

**STAFF PRESENT**

| | |
|---|---|
| Jon Clark | Executive Director |
| Andy Newsum | Deputy Director |
| Sara Cain | Associate Senior Planner |
| Cheryl Massae | Human Resources Manager |
| Ivan Garcia | Programming Specialist |
| Victoria Proctor | Assistant Planner |
| Ashley Carriere | Administrative Assistant |
| Amy White | Assistant Planner |
| Julie Quinn | Chief Financial Officer |

**OTHERS PRESENT**

Lance Atencio, Transdev
Dan Leavitt, SJJPA
Daniel Hartman, AECOM
Daniel Krause, AECOM

Dawn Nevers, City of Oroville

1. **Pledge of Allegiance**
2. **Roll Call**

## CONSENT AGENDA

3. Approval of Minutes from the May 26, 2022 BCAG Board of Directors Meeting
4. Approval of Capital Reserve Funds for IT Infrastructure Upgrades for Butte Regional Transit & BCAG
5. Approval Resolution 2021/22-22 Approving the Revised Allocation Amount for the Low Carbon Transit Operations Program (LCTOP) for the Zero Emission Electric Bus Implementation Project

On motion by Board Member Ritter and seconded by Board Member Nuchols, the Consent Agenda was unanimously approved.

### ITEMS FOR ACTION

**6: Acceptance of the TDA Triennial Performance Audit for BCAG, Butte Regional Transit & the Gridley Golden Feather Flyer**

Staff informed the board that BCAG has contracted with Moore and Associates, Inc. to complete the TDA Triennial Performance Audit for FY 2018/19/2019/20/ and 2020/21 for the county's two transit operators and BCAG. As the state and federally designated transportation planning agency for Butte County, BCAG is responsible for the preparation of all state and federal transportation plans and programs that are required to secure transportation funding for the cities and county. BCAG is also responsible for conduction triennial performance audits of the Local Transportation Funds and State Transit Assistance Funds for the transit operators. BCAG released a Request for Proposals for the TDA Triennial Performance Audit of Two Transit operators and received one proposal from Moore & Associates, Inc. Moore & Associates, Inc. conducted a comprehensive review of BCAG and the two transit operators for the three-year audit period and completed virtual interviews applicable staff from the agencies. The audits can be found on the BCAG website. After acceptance of the item, BCAG staff submitted the audit findings to Caltrans Division of Rail and Mass Transportation.

On motion by Board Member Ritter and seconded by Board Member Calderon, the approval of TDA Triennial Performance Audit for BCAG was unanimously approved

**ITEMS FOR INFORMATION**

**7: North Valley Passenger Rail Strategic Plan Update**

Staff informed the board that the study regarding expanding passenger rail service northward from Sacramento to Butte County, is progressing. The development of the North Valley Passenger Rail Strategic Plan continues to move forward with initial planning work and rail modeling by Caltrans Division of Rail and Mass Transportation. Data was gathered by the Project Management Team, which includes staff from BCAG and San Joaquin Joint Powers Agency and the consultant team at AECOM. The Project Management Team moved forward with determining initial service and operations planning assumptions so that required modeling work by Caltrans DRMT and Union Pacific Railroad could move forward. A PowerPoint presentation given went into more detail regarding the data that was gathered. Development of this data included site visits with the PMT and city/county staff in Chico, Gridley, Oroville, and Marysville as the unincorporated community of Plumas Lake. With the development of the initial assumptions complete, Caltrans DRMT has initiated their modeling analysis using the assumptions as inputs and expects to be completed in late June. The PowerPoint presentation was provided at the meeting by BCAG staff, Dan Levitt from SJJPA, and members of the consultant team at AECOM. Staff will continue to keep the Board informed as this study moves forward.

This item was presented for information purposes.

**8: Non-Emergency Medical Transportation Plan Update**

BCAG staff updated the Board on the progress of the Non-Emergency Medical Transportation Plan. The Non-Emergency Medical Transportation Plan being completed by BCAG to investigate and provide feasible solutions available to individuals not qualifying for ADA or Dial-A-Ride in Butte County. BCAG began working with consultant, AMMA Transit Planning, in August 2021. An online survey has been completed by the project team, met with Social Services Transportation Advisory Council, interview key stakeholders, held an alternatives workshop, and developed the Draft Needs and Alternative Report. The Draft Needs and Alternative Report summarizes the project team's understanding of NEMT needs in Butte County. This report was reviewed by SSTAC and key stakeholders at the alternatives workshop in March. The analysis showed B-Line fixed route and paratransit services do serve some NEMT needs. There are multiple solutions identified in the report to respond to the county's NEMT challenges. The two alternatives that BCAG staff will study in further detail are the creation of a B-Line NEMT Program and a Volunteer-Driver Mileage Reimbursement Program. Both solutions comprehensively address gaps in existing NEMT within Butte County.

BCAG will continue analyzing the operating and capital costs, recommended policies, marketing, and potential implementation strategies of the alternatives discussed in FY 2022/23. The BCAG Board, SSTAC, and key stakeholders will remain engaged and actively participate in these potential solutions. Solutions identified for implementation would likely not be implemented until FY 2023/24.

This item was presented for information purposes

**ITEMS FROM THE FLOOR**

**11: Members of the public may present items to the BCAG Board of Directors, but no action will be taken other than placement on a future agenda.**

**ADJOURNMENT**
With no further items to discuss, the BCAG Board meeting adjourned at 10:04 AM.

**Attest**:
*Jon Clark, Executive Director*
*Ashley Carriere, Board Clerk*
*Butte County Association of Governments*

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

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BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
ITEM #4

BCAG BOARD OF DIRECTORS

**Item #4**
**Consent**

August 25, 2022

**APPROVAL OF FISCAL YEAR 2022/23 PRELIMINARY TRANSPORTATION DEVELOPMENT ACT (TDA) CLAIMS**

**PREPARED BY:** Julie Quinn, Chief Fiscal Officer

**ISSUE:** Transportation Development Act (TDA) regulation requires the governing board of the regional transportation agency approve by resolution all claims filed for the allocation of TDA funds.

**DISCUSSION**: Fiscal Year 2022/23 TDA funds have been apportioned to each jurisdiction with the Findings of Apportionment approved by the BCAG Board on May 26, 2022. A jurisdiction may file an expenditure plan to claim their apportionment for projects in the fiscal year. The FY 2022/23 claims may include unclaimed prior year apportionments. The expenditure plan allocates the apportionments to the prescribed uses within the TDA regulations. It may also include allocations of a locally held fund balance, which is for information purposes only. If no projects are identified for the current apportionment, the funds are considered unallocated apportionment and are held in the jurisdictions name for use in future projects.

Use of the funds is prioritized by the TDA regulations. STA provides funding solely for public transportation services while LTF allocation priorities are as follows:

1. TDA Administration
2. Transportation Planning and Programming
3. Pedestrian and Bicycle projects
4. Rail passenger and Transit services
5. Other transportation purposes including streets and roads. These claims may only be apportioned when all other uses for the funds have been exhausted.

The Preliminary Expenditure Plan identifies the jurisdictions use of funds in accordance with the requirements of the TDA. Butte Regional Transit (BRT) may claim operating and capital funds directly. The Cities and Town may claim funds for other transit needs, as well as bike and pedestrian, and streets and roads projects. In the current year, the City of Biggs has not submitted a preliminary claim but may do so at a later date.

Staff has reviewed the attached claims and found them to be in compliance with the TDA guidelines and within the apportionments approved by this Board. The attached resolution identifies the Local Transportation Fund (LTF) and State Transit Assistance (STA) that has been claimed by the jurisdictions and allows for flexibility should minor adjustments to the form be necessary. Approval of the resolution initiates the distribution of current apportionments to the claimants.

The Final Expenditure Plans will be brought to the Board for approval later in the fiscal year after the FY21/22 TDA audits are complete.

**STAFF RECOMMENDATION**: Staff requests the BCAG Board adopt Resolution No. 2022/23-02 to approve the preliminary TDA Claims for LTF and STA as summarized below:

| | 21/22 | 22/23 | 22/23 | 22/23 |
|---|---|---|---|---|
| **LTF Claimant** | **Prior Unclaimed** | **Apportionment** | **Claimed** | **Unclaimed** |
| BCAG | $ - | $ 650,000 | **$ 650,000** | $ - |
| County Auditor-Controller | - | 25,000 | **25,000** | - |
| Butte Regional Transit | - | 3,840,354 | **3,840,354** | - |
| Butte County | - | 2,133,278 | **2,133,278** | - |
| City of Biggs | - | 65,653 | **65,653** | - |
| City of Chico | 276,609 | 3,483,862 | **3,760,471** | - |
| City of Gridley | - | 243,957 | **243,957** | - |
| City of Oroville | - | 638,690 | **638,690** | - |
| Town of Paradise | 719,603 | 260,887 | **513,590** | 466,900 |
| **LTF Totals** | $ 996,212 | $ 11,341,681 | **$ 11,870,993** | $ 466,900 |
| **STA Claimant** | **Prior Unclaimed** | **Apportionment** | **Claimed** | **Unclaimed** |
| Butte Regional Transit | $ - | $ 2,012,566 | **$ 2,012,566** | $ - |
| City of Gridley- Flyer | - | 87,434 | **87,434** | - |
| **STA Totals** | $ - | $ 2,100,000 | **$ 2,100,000** | $ - |

Key staff: Iván García, Transportation Programming Specialist
Julie Quinn, Chief Fiscal Officer

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# RESOLUTION NO 2022/23-02

## RESOLUTION OF THE PRELIMINARY ALLOCATION OF TRANSPORTATION DEVELOPMENT ACT (TDA) FUNDS TO THE BUTTE COUNTY JURISDICTIONS FOR FISCAL YEAR 2022/23

**WHEREAS**, the Butte County Association of Governments has been designated by the Secretary of the State of California, Business and Transportation Agency, as the Regional Transportation Planning Agency (RTPA) for Butte County, pursuant to the provisions of the Transportation Development Act of 1971, as amended; and

**WHEREAS**, it is the responsibility of the Butte County Association of Governments, under the provision of the Transportation Development Act, to review transportation claims and make allocations of funds from the Local Transportation Fund and the State Transit Assistance fund based on the claims; and

**WHEREAS**, the Auditor of Butte County is required to pay monies in the fund to the claimants pursuant to allocation instructions received by him/her from the Butte County Association of Governments; and

**WHEREAS**, the Butte County Association of Governments has reviewed this claim for Transportation Development Act funds and has made the following findings and allocations:

1. The claimants proposed expenditures are in conformity with the Regional Transportation Plan.

2. The level of passenger fares and charges is sufficient to enable the operator or transit service claimant to meet the fare revenue requirements of Public Utilities Code Sections 99268.2, 99268.3, 99268.5, and 99268.9, as they may be applicable to the claimant.

3. The claimant is making full use of federal funds available under the Federal Transit Act, as amended.

4. The claimant has prepared and submitted the Local Transportation Fund (LTF) and State Transit Assistance (STA) Fund Annual Project and Expenditure Plan.

5. The sum of the claimant's allocation from the State Transit Assistance Fund and the Local Transportation Fund does not exceed the amount the claimant is eligible to receive during the fiscal year.

6. Priority consideration has been given to claims to offset reductions in federal operating assistance and the unanticipated increase in the cost of fuel, to enhance existing public transportation services, and to meet high priority regional, countywide, or area wide public transportation needs.

7. The regional entity may allocate funds to an operator for the purposes specified in Section 6730 of the California Code of Regulations only if, in the resolution allocating the funds, it also finds the following:

a) The operator has made a reasonable effort to implement the productivity improvements recommended pursuant to Public Utilities Code Section 99244. This finding shall make specific reference to the improvements recommended and to the efforts made by the operator to implement them.

b) For an allocation made to an operator for its operating costs, that the operator is not precluded by any contract entered into on or after June 28, 1979, from employment of part time drivers or from contracting with common carriers of persons operating under a franchise or license.

c) A certification by the Department of the California Highway Patrol verifying that the operator is in compliance with Section 1808.1 of the Vehicle Code, as required in Public Utilities Code Section 99251. The certification shall have been completed within the last 13 months, prior to filing claims.

d) The operator is in compliance with the eligibility requirements of Public Utilities Code Section 99314.6.

**TDA ALLOCATED to Butte County Jurisdictions for FY22/23 is as follows:**

| | 21/22 | 22/23 | 22/23 | 22/23 |
|---|---|---|---|---|
| **LTF Claimant** | **Prior Unclaimed** | **Apportionment** | **Claimed** | **Unclaimed** |
| BCAG | $ - | $ 650,000 | **$ 650,000** | $ - |
| County Auditor-Controller | - | 25,000 | **25,000** | - |
| Butte Regional Transit | - | 3,840,354 | **3,840,354** | - |
| Butte County | - | 2,133,278 | **2,133,278** | - |
| City of Biggs | - | 65,653 | **65,653** | - |
| City of Chico | 276,609 | 3,483,862 | **3,760,471** | - |
| City of Gridley | - | 243,957 | **243,957** | - |
| City of Oroville | - | 638,690 | **638,690** | - |
| Town of Paradise | 719,603 | 260,887 | **513,590** | 466,900 |
| **LTF Totals** | $ 996,212 | $ 11,341,681 | **$ 11,870,993** | $ 466,900 |
| **STA Claimant** | **Prior Unclaimed** | **Apportionment** | **Claimed** | **Unclaimed** |
| Butte Regional Transit | $ - | $ 2,012,566 | **$ 2,012,566** | $ - |
| City of Gridley- Flyer | - | 87,434 | **87,434** | - |
| **STA Totals** | $ - | $ 2,100,000 | **$ 2,100,000** | $ - |

**NOW, THEREFORE, BE IT RESOLVED THAT**, all allocations have been prepared in accordance with the above findings and are hereby approved and that the Executive Director is authorized to sign said allocations and to issue the instructions to the County Auditor to pay claimants in accordance with the above allocations as funds become available.

**BE IT FURTHER RESOLVED THAT**, the Butte County Association of Governments authorizes its staff to make any minor technical adjustments that may be necessary to ensure the claimants and BCAG are in compliance of the Transportation Development Act.

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**PASSED AND ADOPTED** by the Butte County Association of Governments on the 25th day of August 2022 by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

**APPROVED:** ____________________________________
JODY JONES, CHAIR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

**ATTEST:** ____________________________________
JON A. CLARK, EXECUTIVE DIRECTOR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** BCAG

**Fiscal Year** 2022/2023

**TDA FUNDING HELD BY BCAG:**

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| 22/23 LTF Apportionment | 650,000 |
| Total Available to Claim | 650,000 |
| Amount claimed | (650,000) |
| Unclaimed TDA | - |

| TDA CLAIMED FOR ARTICLE 3 ONLY | | | | | | | |
|---|---|---|---|---|---|---|---|
| | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | |
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF | | TDA - LTF | | OTHER FUNDS | SOURCE | TOTAL PROJECT |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | | | |
| **TDA Administration** | - | | 136,985 | Article 3, 99233.1 | | | 136,985 |
| **Planning & Programming** | | | 513,015 | Article 3, 99233.2 | | | 513,015 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **ALLOCATED FUNDS** | - | | 650,000 | | - | - | 650,000 |

BCAG: Ivan Garcia or Julie Quinn 809-4616

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** Butte County Auditor-Controller

**Fiscal Year** 2022/2023

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

**TDA FUNDING HELD BY BCAG:**

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| 22/23 LTF Apportionment | 25,000 |
| Total Available to Claim | 25,000 |
| Amount claimed | (25,000) |
| Unclaimed TDA | - |

| TDA CLAIMED FOR ARTICLE 3 ONLY | | | | | | | |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | TOTAL PROJECT |
| | TDA - LTF | | TDA - LTF | | OTHER FUNDS | SOURCE | |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | | | |
| TDA Administration | - | | 25,000 | Article 3, 99233.1 | | | 25,000 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| ALLOCATED FUNDS | - | | 25,000 | | - | - | 25,000 |

BCAG: Ivan Garcia or Julie Quinn 809-4616

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF) and STATE TRANSIT ASSISTANCE (STA)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** Butte Regional Transit

**Fiscal Year** 2022/2023

**TDA FUNDING HELD BY BCAG:**

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| LTF Apportionment | 3,840,354 |
| STA Apportionment | 2,012,566 |
| Total Available to Claim | 5,852,920 |
| Amount claimed | (5,852,920) |
| Unclaimed TDA | - |

| TDA CLAIMED FOR ARTICLE 4 AND 8 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | FUND BALANCE USED | | CLAIMED FUNDS | | CLAIMED FUNDS | | |
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF Carryover | | TDA - LTF | | TDA - STA | | TOTAL PROJECT |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | LTF $ amount | CCR Section | |
| **Public Transit/** B-line Fixed Route | 824,610 | Article 4, 99260(a) | 2,033,012 | Article 4, 99260(a) | 1,612,566 | Art 4, Sec 6730 (a) | 4,470,188 |
| **Public Transit/** B-line Paratransit | 276,577 | Article 4, 99260(a) | 1,407,342 | Article 4, 99260(a) | - | | 1,683,919 |
| **Transit Planning& Capital/** B-line Capital Reserve | | | 400,000 | Article 4, 99262 | | | 400,000 |
| **Transit Planning& Capital/** B-line STA Reserve | | | - | | 400,000 | Art 4, Sec 6730 (b) | 400,000 |
| | | | - | | | | - |
| ALLOCATED FUNDS | 1,101,187 | | 3,840,354 | | 2,012,566 | - | 6,954,107 |

Local Contact: Andy Newsum/ Sara Cain

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY BRT:**

| | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c ) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| **TDA held by BRT:** | | | | |
| Transit- LTF | 1,101,187 | 3,840,354 | 4,941,541 | - |
| Transit- STA | - | 2,012,566 | 2,012,566 | - |
| **Total TDA Funds** | 1,101,187 | 5,852,920 | 6,954,107 | - |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** County of Butte

**Fiscal Year** 2022/2023

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

**TDA FUNDING HELD BY BCAG:**

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| 22/23 LTF Apportionment | 2,133,278 |
| Total Available to Claim | 2,133,278 |
| Amount claimed | (2,133,278) |
| Unclaimed TDA | - |

| TDA CLAIMED FOR ARTICLE 8 ONLY | | | | | | | |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | TOTAL PROJECT |
| | TDA - LTF | | TDA - LTF | | | | |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | OTHER FUNDS | SOURCE | |
| **Transit- Public or Special Assistance** / Transit Service (Gridley flyer) | - | Article 8, 99400 (c) | 4,000 | Article 8, 99400 (c) | | local income | 4,000 |
| **Passenger Rail Operations & Capital** / Rail Service (Amtrack) | | Article 8, 99400 (b) | 1,680 | Article 8, 99400 (b) | | other agency con | 1,680 |
| **Transportation Planning & Admin**/ Streets & Roads Planning | 1,000 | Article 8, 99402 | - | Article 8, 99402 | | | 1,000 |
| **Transportation Planning & Admin**/ Bike & Ped Planning | | Article 8, 99402 | - | Article 8, 99402 | | | |
| **Streets & Road Maintenance** - Pavement Improvements | | Article 8, 99400 (a) | 1,878,641 | Article 8, 99400 (a) | | | 1,878,641 |
| **Capital Projects for Streets & Road**/ provide capital listing | 399,558 | Article 8, 99400 (a) | 248,957 | Article 8, 99400 (a) | | | 648,515 |
| **Capital Projects for Bike & Ped**/ provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | |
| **ALLOCATED FUNDS** | 400,558 | | 2,133,278 | | - | - | 2,533,836 |

Local Contact: Amanda Partain

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY CITY:**

| TDA Fund: | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| Transit/ Rail LTF | - | 5,680 | 5,680 | - |
| Transportation LTF | 400,558 | 2,127,598 | 2,528,156 | - |
| Unclaimed current TDA apportionment | - | - | - | - |
| Total TDA | 400,558 | 2,133,278 | 2,533,836 | - |
| Expense covered with Other Revenue | - | - | - | - |
| Total City Transportation Fund | 400,558 | 2,133,278 | 2,533,836 | - |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** City of Biggs

**Fiscal Year** 2022/2023

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

### TDA FUNDING HELD BY BCAG

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| 22/23 LTF Apportionment | 65,653 |
| Total Available to Claim | 65,653 |
| Amount claimed | (65,653) |
| Unclaimed TDA | - |

### TDA CLAIMED BY PUC CATEGORY

| TDA CLAIMED FOR ARTICLE 8 ONLY | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | TOTAL PROJECT |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF | | TDA - LTF | | OTHER FUNDS | SOURCE | |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | | | |
| **Transit- Public or Special Assistance** / Transit Service | - | Article 8, 99400 (c) | | Article 8, 99400 (c) | | local income | |
| **Passenger Rail Operations & Capital** / Rail Service | | Article 8, 99400 (b) | | Article 8, 99400 (b) | | other agency contributions | |
| **Transportation Planning & Admin/** Streets & Roads Planning | | Article 8, 99402 | - | Article 8, 99402 | | | |
| **Transportation Planning & Admin/** Bike & Ped Planning | | Article 8, 99402 | 50,000 | Article 8, 99402 | | | 50,000 |
| **Streets & Road Maintenance** - Pavement Improvements | 34,860 | Article 8, 99400 (a) | 15,653 | Article 8, 99400 (a) | | | 50,513 |
| **Capital Projects for Streets & Road/** provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | |
| **Capital Projects for Bike & Ped/** provide capital listing | 100,000 | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | 100,000 |
| **ALLOCATED FUNDS** | 134,860 | | 65,653 | | - | - | 200,513 |

Local Contact: Dennis Schmidt, Trin Campos

BCAG: Ivan Garcia or Julie Quinn 809-4616

### TDA FUNDING HELD BY CITY

| TDA Fund: | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c ) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| Transit/ Rail LTF - Fund 70? | - | - | - | - |
| Transportation LTF - Fund 80 | 134,860 | 65,653 | 200,513 | - |
| Unclaimed current TDA apportionment | - | - | - | - |
| Total TDA | 134,860 | 65,653 | 200,513 | - |
| Expense covered with Other Revenue | - | - | - | - |
| **Total City Transportation Fund** | 134,860 | 65,653 | 200,513 | - |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** City of Chico

**Fiscal Year** 2022/2023

X Preliminary — Submitted August 2022

Final — Submitted May or June 2023

**TDA FUNDING HELD BY BCAG:**

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | 276,609 |
| 22/23 Apportionment | 3,755,223 |
| Total Available to Claim | 4,031,832 |
| Amount claimed | (4,031,832) |
| Unclaimed TDA | - |

| TDA CLAIMED FOR ARTICLE 8 ONLY | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF | | TDA - LTF | | | | TOTAL PROJECT |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | OTHER FUNDS | SOURCE | |
| **Transit- Public or Special Assistance** / Transit Service | | Article 8, 99400 (c) | 45,526 | Article 8, 99400 (c) | 30,792 | local income | 76,318 |
| **Transit Planning & Administration** /Transit allocated costs | | Article 8, 99400 (d) | - | Article 8, 99400 (d) | | | |
| **Transit Capital** /Transit Center Maint & Utilities | | Article 8, 99400 (e) | - | Article 8, 99400 (e) | | | |
| **Passenger Rail Operations & Capital** / Rail Service | | Article 8, 99400 (b) | 20,999 | Article 8, 99400 (b) | 22,200 | other agency contributions | 43,199 |
| **Transportation Planning & Admin**/ Streets & Roads Planning | | Article 8, 99402 | 453,672 | Article 8, 99402 | | | 453,672 |
| **Transportation Planning & Admin**/ Bike & Ped Planning | | Article 8, 99402 | 181,900 | Article 8, 99402 | | | 181,900 |
| **Streets & Road Maintenance** - Pavement Improvements | | Article 8, 99400 (a) | 92,953 | Article 8, 99400 (a) | | | 92,953 |
| **Capital Projects for Streets & Road**/ provide capital listing | | Article 8, 99400 (a) | 2,346,464 | Article 8, 99400 (a) | | | 2,346,464 |
| **Capital Projects for Bike & Ped**/ provide capital listing | 199,682 | Article 8, 99400 (a) | 890,318 | Article 8, 99400 (a) | | | 1,090,000 |
| **ALLOCATED FUNDS** | 199,682 | | 4,031,832 | | 52,992 | - | 4,284,506 |

Local Contact: Linda Herman, Amanda McGarr, Leigh Ann Sutton

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY CITY:**

| TDA Fund: | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| Transit/ Rail LTF | - | 66,525 | 66,525 | - |
| Transportation LTF | 709,880 | 3,688,698 | 3,888,380 | 510,198 |
| Unclaimed current TDA apportionment | 276,609 | - | 276,609 | - |
| Total TDA | 986,489 | 3,755,223 | 4,231,514 | 510,198 |
| Expense covered with Other Revenue | - | 52,992 | 52,992 | - |
| **Total City Transportation Fund** | 986,489 | 3,808,215 | 4,284,506 | 510,198 |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF) and STATE TRANSIT ASSISTANCE (STA)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** City of Gridley

**Fiscal Year** 2022/2023

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

**TDA FUNDING HELD BY BCAG:**

| FY 22/23 APPORTIONMENTS | | |
|---|---|---|
| Prior Year Appt Balance | - | Beginning Due to City/ Due from BCAG |
| 22/23 LTF Apportionment | 243,957 | Current year LTF Revenue |
| 22/23 STA Apportionment | 87,434 | Current year STA Revenue |
| Total Available to Claim | 331,391 | |
| Amount claimed | (331,391) | Show the use of distributed funds in column F and H |
| Unclaimed TDA | - | Ending Due to City/ Due from BCAG |

| TDA CLAIMED FOR ARTICLE 4 AND 8 | FUND BALANCE USED | | CLAIMED FUNDS | | CLAIMED FUNDS | | |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF | | TDA - LTF | | TDA - STA | | TOTAL PROJECT |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | LTF $ amount | CCR Section | |
| **Public Transportation** / Taxi Service | | Article 4, 99260(a) | 26,328 | Article 4, 99260(a) | 87,434 | Art 4, Sec 6730 (a) | 113,762 |
| **Transportation Planning & Admin**/ Streets & Roads Planning | | Article 8, 99402 | - | Article 8, 99402 | | | - |
| **Streets & Road Maintenance** - Pavement Improvements | 32,534 | Article 8, 99400 (a) | 217,629 | Article 8, 99400 (a) | | | 250,163 |
| **Capital Projects for Streets & Road**/ provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | |
| **Capital Projects for Bike & Ped**/ provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | - |
| **ALLOCATED FUNDS** | **32,534** | | **243,957** | | **87,434** | - | **363,925** |

Local Contact: Elisa Arteaga

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY CITY:**

| | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| **Transportation Fund held by City:** | | | | |
| Transportation- LTF (Fund 430) | 32,534 | 217,629 | 250,163 | - |
| Unclaimed current TDA apportionment | - | - | - | - |
| **Total Transportation Fund** | 32,534 | 217,629 | 250,163 | - |
| **Transit Fund held by City:** | | | | |
| Transit- LTF | (153,877) | 26,328 | 26,328 | (153,877) |
| Transit- STA | - | 87,434 | 87,434 | - |
| **Total Transit Fund** | (153,877) | 113,762 | 113,762 | (153,877) |
| **Total TDA Funds** | **(121,343)** | **331,391** | **363,925** | **(153,877)** |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** City of Oroville

**Fiscal Year** 2022/2023

X Preliminary — Submitted Aug 2022

___ Final — Submitted May or June 2023

**TDA FUNDING HELD BY BCAG:**

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | - |
| 22/23 LTF Apportionment | 638,690 |
| Total Available to Claim | 638,690 |
| Amount claimed | (638,690) |
| Unclaimed TDA | - |

**TDA CLAIMED FOR ARTICLE 8 ONLY**

| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | FUND BALANCE USED TDA - LTF: LTF $ amount | FUND BALANCE USED TDA - LTF: PUC Section | CLAIMED FUNDS TDA - LTF: LTF $ amount | CLAIMED FUNDS TDA - LTF: PUC Section | OTHER FUNDING SOURCES: OTHER FUNDS | OTHER FUNDING SOURCES: SOURCE | TOTAL PROJECT |
|---|---|---|---|---|---|---|---|
| **Transit- Public or Special Assistance** / Transit Service | - | Article 8, 99400 (c) | | Article 8, 99400 (c) | | local income | |
| **Passenger Rail Operations & Capital** / Rail Service | | Article 8, 99400 (b) | | Article 8, 99400 (b) | | other agency contributions | |
| **Transportation Planning & Admin**/ Streets & Roads Planning | | Article 8, 99402 | - | Article 8, 99402 | | | |
| **Transportation Planning & Admin**/ Bike & Ped Planning | | Article 8, 99402 | - | Article 8, 99402 | | | |
| **Streets & Road Maintenance** - Pavement Improvements | 644,699 | Article 8, 99400 (a) | 638,690 | Article 8, 99400 (a) | | | 1,283,389 |
| **Capital Projects for Streets & Road**/ provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | |
| **Capital Projects for Bike & Ped**/ provide capital listing | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | |
| **ALLOCATED FUNDS** | 644,699 | | 638,690 | | - | - | 1,283,389 |

Local Contact: Ruth Duncan, Matt Thompson

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY CITY:**

| TDA Fund: | Beginning Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c ) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| Transit/ Rail LTF | - | - | - | - |
| Transportation LTF | 644,699 | 638,690 | 1,283,389 | - |
| Unclaimed current TDA apportionment | - | - | - | - |
| Total TDA | 644,699 | 638,690 | 1,283,389 | - |
| Expense covered with Other Revenue | - | - | - | - |
| Total City Transportation Fund | 644,699 | 638,690 | 1,283,389 | - |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## LOCAL TRANSPORTATION FUND (LTF)

## ANNUAL PROJECT AND EXPENDITURE PLAN

**Claimant:** Town of Paradise

**Fiscal Year** 2022/2023

**TDA FUNDING HELD BY BCAG:**

X Preliminary — Submitted Aug 2022

Final — Submitted May or June 2023

| FY 22/23 APPORTIONMENTS | |
|---|---|
| Prior Year Appt Balance | 719,603 |
| 22/23 LTF Apportionment | 260,887 |
| Total Available to Claim | 980,490 |
| Amount claimed | (513,590) |
| Unclaimed TDA | 466,900 |

| TDA CLAIMED FOR ARTICLE 8 ONLY | FUND BALANCE USED | | CLAIMED FUNDS | | OTHER FUNDING SOURCES | | |
|---|---|---|---|---|---|---|---|
| TDA STATUTE DESCRIPTION & LOCAL AGENCY PROJECT TITLE | TDA - LTF | | TDA - LTF | | | | TOTAL PROJECT |
| | LTF $ amount | PUC Section | LTF $ amount | PUC Section | OTHER FUNDS | SOURCE | |
| **Transit- Public or Special Assistance** / Transit Service | - | Article 8, 99400 (c) | | Article 8, 99400 (c) | | local income | |
| **Passenger Rail Operations & Capital** / Rail Service | | Article 8, 99400 (b) | | Article 8, 99400 (b) | | other agency contributions | |
| **Transportation Planning & Admin**/ Streets & Roads Planning | 104,693 | Article 8, 99402 | 30,000 | Article 8, 99402 | | | 134,693 |
| **Transportation Planning & Admin**/ Bike & Ped Planning | | Article 8, 99402 | - | Article 8, 99402 | | | |
| **Streets & Road Maintenance** - Pavement Improvements | | Article 8, 99400 (a) | - | Article 8, 99400 (a) | | | - |
| **Capital Projects for Streets & Road**/ provide capital listing | 85,252 | Article 8, 99400 (a) | 230,887 | Article 8, 99400 (a) | | | 316,139 |
| **Capital Projects for Bike & Ped**/ provide capital listing | 107,257 | Article 8, 99400 (a) | 252,703 | Article 8, 99400 (a) | | | 359,960 |
| **ALLOCATED FUNDS** | 297,202 | | 513,590 | | - | - | 810,792 |

Local Contact: Ross Gilb, Marc Mattox

BCAG: Ivan Garcia or Julie Quinn 809-4616

**TDA FUNDING HELD BY CITY:**

| TDA Fund: | Estimated Beg Fund Balance (a) | 22/23 Revenue (b) | 22/23 Expense (c) | Estimated End Fund Balance (a+b-c) |
|---|---|---|---|---|
| Transit/ Rail LTF | - | - | - | - |
| Transportation LTF | 297,202 | 260,887 | 558,089 | - |
| Unclaimed current TDA apportionment | 719,603 | - | 252,703 | 466,900 |
| Total TDA | 1,016,805 | 260,887 | 810,792 | 466,900 |
| Expense covered with Other Revenue | - | - | - | - |
| Total City Transportation Fund | 1,016,805 | 260,887 | 810,792 | 466,900 |

# Butte County Association of Governments

BCAG

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# Board of Directors Meeting
# ITEM #5

# BCAG BOARD OF DIRECTORS

**Item #5**
**Consent**

August 25, 2022

**APPROVAL OF AMENDMENT 1 TO THE 2022/23 OVERALL WORK PROGRAM (OWP) & BUDGET AND OVERALL WORK PROGRAM AGREEMENT (OWPA)**

**PREPARED BY:** Julie Quinn, Chief Fiscal Officer

**ISSUE:** BCAG Chief Fiscal Officer is requesting the BCAG Board of Directors approval of an amendment with an effective date of July 1, 2022 for the FY22/23 OWP & Budget.

**DISCUSSION:** Amendment #1 adjusts the following work elements (WE) to reflect actual costs of contracted expense development of two new work elements and for a total increase to revenue and expense of $193,862.

The following changes by work element are:

- WE 23-108 *REAP Grant Coordination*: Removes Regional Early Action Plan (REAP) 2.0 funding and adjusts REAP 1.0 to match suballocation and administration carryover from the prior fiscal year.
- WE 23-127 *REAP 2.0- 2024 SCS Development:* Addition of a new work element to track the 2024 Sustainable Communities Strategy (SCS) development funded by REAP 2.0.
- WE 23-128 *Travel Demand Study:* The actual cost of the consultant was higher than the estimate. Budgeted revenue will be offset with additional LTF Planning.
- WE 23-216 *SR 191 Mitigation:* Addition of work element to complete the mitigation work on SR 191 which is fully funded with federal SHOPP funding. The project description, tasks and products are included in the attached Work Element 22-216.

Attached is a summary of adjustments to the FY22/23 OWP & Budget and new Work Elements (WE) 23-127 and WE 23-216.

**STAFF RECOMMENDATION:** Approve Amendment of the FY22/23 Overall Work Program & Budget and the OWP Agreement.

Key Staff: Julie Quinn, Chief Fiscal Officer
Jon Clark, Executive Director
Chris Devine, Planning Director

## FISCAL YEAR 2022/23
## SUMMARY OF OWP AMENDMENT 1 (OWPA AMENDMENT 2)

| ***23-108 REAP Grant Coordination*** | PRIOR | AMENDED | NET CHANGE |
|---|---|---|---|
| REAP 1.0 | 620,238 | 635,023 | 14,785 |
| REAP 2.0 | 26,887 | - | (26,887) |
| **TOTAL REVENUE** | **647,125** | **635,023** | **(12,102)** |
| SALARIES & BENEFITS | 13,834 | 13,621 | (213) |
| SUB ALLOCATIONS | 620,238 | 608,551 | (11,687) |
| CONSULTANT | | | |
| INDIRECT | 13,053 | 12,851 | (202) |
| **TOTAL EXPENDITURES** | **647,125** | **635,023** | **(12,102)** |

| ***23-127 REAP 2.0- 2024 SCS Development*** | PRIOR | AMENDED | NET CHANGE |
|---|---|---|---|
| REAP 2.0 | - | 164,700.00 | 164,700 |
| LTF | - | 12,186.00 | 12,186 |
| **TOTAL REVENUE** | **-** | **176,886.00** | **176,886.00** |
| SALARIES & BENEFITS | - | 13,834.00 | 13,834 |
| CONSULTANTS | - | 150,000.00 | 150,000 |
| INDIRECT | - | 13,052.00 | 13,052 |
| **TOTAL EXPENDITURES** | **-** | **176,886.00** | **176,886.00** |

| **23-128 SB1 STP 21/22 - Regional Travel Survey** | PRIOR | AMENDED | NET CHANGE |
|---|---|---|---|
| SB1 STP 21/22 | 84,350 | 84,350 | - |
| LTF PLANNING | 10,929 | 23,387 | 12,458 |
| **TOTAL REVENUE** | **95,279** | **107,737** | **12,458** |
| SALARIES & BENEFITS | 13,834 | 13,834 | - |
| CONSULTANTS- | 68,392 | 80,850 | 12,458 |
| INDIRECT | 13,053 | 13,053 | - |
| **TOTAL EXPENDITURES** | **95,279** | **107,737** | **12,458** |

| **23-216 SR 191 Mitigation** | PRIOR | AMENDED | NET CHANGE |
|---|---|---|---|
| SHOPP | - | 16,620 | 16,620 |
| **TOTAL REVENUE** | **-** | **16,620** | **16,620** |
| CONSULTANT LAND TRUST | - | 8,773 | 8,773 |
| LAND OWNER | - | 7,847 | 7,847 |
| **TOTAL EXPENDITURES** | **-** | **16,620** | **16,620** |

| **NET CHANGE IN BUDGET REVENUE:** | PRIOR | AMENDED | **NET CHANGE** |
|---|---|---|---|
| LTF PLANNING | $ 537,377 | 562,021 | 24,644 |
| REAP | $ 647,125 | 799,723 | 152,598 |
| SHOPP | $ - | 16,620 | 16,620 |
| **NET BUDGET REVENUE CHANGE** | | | **$ 193,862** |
| PREVIOUS OWP REVENUE- | | | 6,354,821 |
| Amended Total Programmed | | | 6,548,683 |
| Less amounts programmed for future years | | | - |
| **AMENDED TOTAL OWP REVENUE** | | | **$ 6,548,683** |
| SALARIES | $ 1,980,893 | $ 1,994,514 | 13,621 |
| INDIRECT | $ 1,541,460 | $ 1,554,310 | 12,850 |
| SERVICES & SUPPLIES | $ 2,832,468 | $ 2,999,859 | 167,391 |
| **NET BUDGET EXPENDITURE CHANGE** | | | **$ 193,862** |
| PREVIOUS OWP EXPENDITURES | | | 6,354,821 |
| **AMENDED TOTAL OWP EXPENDITURES** | | | **$ 6,548,683** |

## 23-127 |REAP 2.0 - 2024 SCS DEVELOPMENT

**OBJECTIVE:** To develop the non-technical components of the 2024 BCAG Sustainable Communities Strategy update.

**DESCRIPTION:** The development of the non-technical components of the 2024 SCS update is being funded through the Regional Early Action Planning grants program of 2021 (REAP 2.0). This program was established as part of the 2021 California Comeback Plan under AB 140. Work under this Work Element, along with the technical components under Work Element 23-129, will lead to the completion of the BCAG SCS update in December of 2024.

As the region's Metropolitan Planning Organization (MPO), BCAG is designated by the state to prepare the area's SCS as an additional element of the RTP. The SCS is the forecasted development pattern for the region, which, when integrated with the transportation network, and other transportation measures and policies, will meet the passenger vehicle greenhouse gas reduction target for the area.

BCAG's first SCS was prepared for the 2012 RTP and focused on bringing together newly developed local land use plans to lay out a future development pattern for the region which balanced housing and employment growth within specified growth areas, protected sensitive habitat and open space, and invested in a multi-modal transportation system. The 2016 SCS (2nd cycle) expanded on the efforts of the 2012 plan by integrating a new long-range transit and non-motorized plan. BCAG's 2020 SCS (3rd cycle) included updated regional forecasts to account for the effects of the Camp Fire, modified jobs-to-housing ratios, as well as an updated housing mix to reflect recent trends.

During the 2022/23 fiscal year, BCAG will begin development of the 2024 SCS working with a qualified consultant team to develop the non-technical components of the SCS. A separate Work Element (WE 23-129) includes development of initial technical components of the 2024 SCS update including BCAG land use model update. The following activities will be accomplished under WE 23-127: consultant kick-off meeting and coordination; initial community outreach and priority setting; draft and final Initial Community Outreach and Priority Setting Summary Report; Ongoing SCS public outreach and coordination; gathering and developing required data to consider; development of scenarios and strategies for land use, housing and transportation, and development of presentation materials for BCAG Board of Directors meetings.

BCAG will coordinate all work activities with the BCAG Planning Director's Group (PDG) consisting of representatives from BCAG member jurisdictions, the Butte County Air Quality Management District, and Butte Local Agency Formation Commission (LAFCO). Outreach will be conducted in accordance with BCAG's Public Participation Plan, which includes the region's Disadvantaged Communities.

BCAG will also coordinate with the North State Planning and Development Collective and other collaborating partners on the development and implementation of the Community Economic Resilience Fund (CERF) in our region. The CERF was created to promote a sustainable and equitable recovery from the economic distress of COVID-19 by supporting new plans and strategies to diversify local economies and develop sustainable industries that create high quality, broadly accessible jobs for all Californians.

**PREVIOUS WORK:** BCAG prepared the region's first SCS as part of the 2012 RTP. The latest SCS was prepared as an additional element of the 2020 RTP and was adopted in December of 2020. During the 2019/20 and 2020/21 fiscal years, BCAG competed the following:

- Coordinated development of SCS for 2020 RTP and initiate development of 2024 SCS
- Development of regional land use allocation model for 2020 SCS
- Development of technical methodology for 2020 SCS
- Updates to SCS regional planning datasets for 2020 SCS
- Coordinated meetings of the BCAG Planning Directors Group, attended state agency and MPO coordinating meetings, and responded to state agency requests in developing 2020 SCS
- Public outreach activities in support of 2020 SCS

**TASKS**

1) Develop Request for Proposals – July 2022
2) Consultant kick-off meeting and coordination (*BCAG, Consultant*) – September 2022
3) Initial community outreach and priority setting (*Consultant*) – September through November 2022
4) Draft and Final Initial Community Outreach and Priority Setting Summary Report (*Consultant*) – December 2022
5) Ongoing SCS public outreach and coordination (*Consultant)* – January 2023 through June 2023
6) Gather/develop required data to consider (*Consultant)* – September through December 2022
7) Develop scenarios & strategies for land use, housing and transportation (*Consultant)* – January 2023 through June 2023
8) Coordinate on development and implementation of CERF program (*BCAG)* – January through June 2023
9) BCAG Board of Directors meetings (*Consultant)* – January, May 2023

| WE 23-127 PRODUCTS | SCHEDULE |
|---|---|
| 1. Request for proposals document | July 2022 |
| 2. Kick-off meeting agenda and notes | September 2022 |
| 3. Community Outreach materials, priority setting report | November 2022 |
| 4. Draft and Final Initial Community Outreach and Priority Setting Summary Report | December 2022 |
| 5. Ongoing Public Outreach materials | June 2023 |
| 6. Data required to be considered memo | December 2022 |
| 7. Scenarios and strategies for land use, housing and transportation memo | June 2023 |
| 8. BCAG Board of Directors presentation materials | January, May 2023 |
| | |

| STAFFING | PERSON MONTHS |
|---|---|
| | |
| Planning Director | 1.0 |
| | |
| **TOTAL** | **1.0** |

| REVENUES | | EXPENDITURES | |
|---|---|---|---|
| REAP 2.0 Advance Allocation Funds | $164,700 | Personnel | $13,834 |
| LTF MATCH | $12,186 | Consultant | $150,000 |
| | | Indirect Costs | $ 13,052 |
| | | | |
| | | | |
| **TOTAL** | **$176,886** | **TOTAL** | **$176,886** |

## 23-216 | STATE ROUTE 191 MITIGATION

**OBJECTIVE:** To ensure reporting requirements are completed and wasting account funding is disbursed annually for the Dixon Ranch conservation easement project completed as required mitigation for the State Route 191 State Highway Operations and Protection Program (SHOPP) project south of the Town of Paradise.

**DESCRIPTION:** BCAG was requested by Caltrans District 3 to implement the required mitigation for the State Route 191 SHOPP project south of the Town of Paradise in Butte County. Staff executed a Cooperative Agreement with Caltrans during the 2019-2020 Fiscal Year defining the terms and funding requirements to accomplish the mitigation. The mitigation project involved locating and protecting in perpetuity a sufficient acreage of blue oak woodland via voluntary conservation agreement with willing landowner.

During the 2019-2020 and 2020-2021 Fiscal Years, BCAG entered into an Option Agreement to purchase a conservation easement on a 427.4-acre site (Dixon Ranch) northeast of Chico that meets the project mitigation requirements. A Land Management Plan (LMP) was developed along with necessary documents and agreements with Northern California Regional Land Trust (NCRLT) to manage the easement and endowment and oversee the required management and monitoring of the mitigation lands in perpetuity.

During the 2021-2022 Fiscal Year, all work was completed with Caltrans and NCRLT, with the final execution of the purchase of the conservation easement, funding of the endowments, and execution of agreements.

During the 2022-2023 Fiscal Year, BCAG staff will review annual funding and management reports developed and submitted by NCRLT, and ensure Caltrans' receipt of reports as well.

Additionally, to allow adequate time for capitalization of the principal in the Land Management Endowment and Monitoring and Stewardship Endowment, BCAG established a wasting account to cover costs incurred by the seller and NCRLT during the first three years after close of escrow. BCAG will disburse funds from a wasting account funded by Caltrans to Property Owner for its performance of the Land Management Activities on the Preserve Property during the first three years following the Preserve Establishment Date (June 30, 2022 – June 30, 2025). The annual distribution from the wasting account will be no more than $7,847.13, for which Property Owner will submit an invoice to BCAG for reimbursement.

BCAG will also disburse funds from the wasting account to NCRLT for its performance of activities necessary to ensure compliance with and enforce the Conservation Easement on the Preserve Property during the first three years following recordation of the Conservation Easement (June 30, 2022 – June 30, 2025). The annual distribution from the wasting account will be no more than $8,772.48, for which NCRLT will submit an invoice to BCAG. Interim funding shall cease following this initial three-year capitalization period. Beginning in the fourth year following recordation of the

Conservation Easement NCRLT will disburse Stewardship Funding from the Endowment Account to itself and Land Owner in accordance with the Endowment Assessment and associated agreements.

**TASKS**

1) Review annual Funding Report and Management Report from NCRLT – January 2023

2) Process annual invoice from NCRLT – February 2023

3) Process annual invoice from Land Owner – February 2023

| PRODUCTS | SCHEDULE |
|---|---|
| 1. Annual Funding and Management Reports | January 2023 |
| 2. Completed invoices | February 2023 |

| STAFFING | PERSON MONTHS |
|---|---|
| | |
| | |
| | |
| | |
| **TOTAL** | **0** |

| REVENUES | | EXPENDITURES | |
|---|---|---|---|
| SHOPP FUNDING | $16,620 | Personnel | 0 |
| | | Land Owner | $7,847 |
| | | NCRLT | $8,773 |
| | | | |
| **TOTAL** | **$16,620** | **TOTAL** | **$16,620** |

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
# ITEM #6

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## BCAG BOARD OF DIRECTORS

**Item #6**
**Consent**

August 25, 2022

**APPROVAL OF THE PROJECT LIST FOR THE FY 2022/23 CALIFORNIA STATE OF GOOD REPAIR (SGR) PROGRAM**

**PREPARED BY:** Sara Cain, Senior Planner

**ISSUE:** The project list for the FY 2022/23 State of Good Repair allocation is submitted for approval.

**DISCUSSION**: As the Regional Transportation Planning Agency, BCAG has been given the responsibility to compile, approve and submit to the Department of Transportation, an annual list of eligible projects from transit operators in the region to be funded with State of Good Repair annual allocations. As specified in SB1, the Road Repair and Accountability Act of 2017, effective January 1, 2018, the State of California imposes a transportation improvement fee, which is a supplemental charge on the registration of vehicles. A portion of the revenues generated from this fee establishes the SGR Program. SGR funds are made available for eligible capital projects that maintain the public transit system in a state of good repair.

Estimates of annual funding are provided by the State Controller's Office. Allocations are based on population and farebox revenues. For FY 2022/23 the estimated allocation is $328,552. Butte Regional Transit has submitted its proposed project to purchase a zero-emission bus using FY 2022/23 SGR funds.

**STAFF RECOMMENDATION:** Staff requests the BCAG Board approve the FY 2022/23 SGR by Resolution 2022/23-01.

Key Staff: Julie Quinn, Chief Fiscal Officer
Sara Cain, Senior Planner

**BUTTE COUNTY ASSOCIATION OF GOVERNMENTS**

# RESOLUTION NO 2022/2023-01

**APPROVAL OF THE PROJECT LIST FOR THE FY 2022-23 CALIFORNIA STATE OF GOOD REPAIR (SGR) PROGRAM**

**WHEREAS,** Senate Bill 1 (SB 1), the Road Repair and Accountability Act of 2017, establishing the State of Good Repair (SGR) program to fund eligible transit maintenance, rehabilitation and capital project activities that maintain the public transit system in a state of good repair; and

**WHEREAS,** Butte County Association of Governments (BCAG) is an eligible project sponsor and may receive and distribute State Transit Assistance – SGR funds to eligible local agencies for eligible transit capital projects;

**WHEREAS,** BCAG is distributing SGR funds to eligible local agencies under its regional jurisdiction; and

**WHEREAS**, the regions share of SGR funds for FY 2022/23 is estimated by the State Controller's Office to be $328,552; and

**WHEREAS**, BCAG concurs with and approves these funds for the following purposes:

| | | |
|---|---|---|
| Butte Regional Transit | $328,552 | Bus Replacement |

**WHEREAS**, in order to qualify for these funds, the Butte County Association of Governments is required to submit a proposed project list to California Department of Transportation (Caltrans) on an annual basis; and

**NOW, THEREFORE, BE IT RESOLVED** that the Board of Directors of the Butte County Association of Governments hereby approves the SB1 State of Good Repair Project List for FY 2022-23; and

**NOW, THEREFORE, BE IT RESOLVED** by the Board of Directors of the Butte County Association of Governments that the fund recipient agrees to comply with all conditions and requirements set forth in the Certification and Assurances document and applicable statutes, regulations and guidelines for all SGR funded transit capital projects.

**NOW THEREFORE, BE IT FURTHER RESOLVED** that the Senior Planner is hereby authorized to submit a request for Scheduled Allocation of the SB1 State of Good Repair Funds and to execute the related grant applications, forms and agreements.

**PASSED AND ADOPTED** by the Butte County Association of Governments on the 25th day of August 2022 by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

**APPROVED:** ________________________________________
JODY JONES, CHAIR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

**ATTEST:** ________________________________________
JON A. CLARK, EXECUTIVE DIRECTOR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## BOARD OF DIRECTORS MEETING
## ITEM #7

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BCAG BOARD OF DIRECTORS

**Item #7**
**Consent**

August 25, 2022

**APPROVAL OF BCAG/B-LINE AGENCY SAFETY PLAN (ASP) ANNUAL REVIEW**

**PREPARED BY:** Amy White, Assistant Planner

**ISSUE:** Staff has completed the FY 2022/23 annual review and update process of the Agency Safety Plan as required by the Public Transportation Agency Safety Plan regulation 49 CFR Part 673. Board approval is required by this rule as part of the review process.

**DISCUSSION:** On July 19, 2018, FTA published the Public Transportation Agency Safety Plan (PTASP) Final Rule, which requires certain operators of public transportation systems that receive federal funds under FTA's Urbanized Area Formula (5307) Grants to develop agency safety plans (ASPs) that include the processes and procedures to implement Safety Management Systems (SMS).

BCAG completed the process of developing and approving the ASP on June 25, 2020. The ASP, as a base document, is then required to go through an annual review process. If any changes are made to the ASP, such as updates to procedures, targets or agency information, Board approval and a signature from the Accountable Executive are required.

During this year's review, several changes were made to clarify regulation terminology and the review timeline. Updates were also made to agency data and safety performance targets. A full list of the changes made, from Appendix VI of the ASP, is attached for reference. The full ASP document is available upon request or by following this link: BCAG/B-line Agency Safety Plan.

**STAFF RECOMMENDATION:** Staff requests the Board approve the ASP annual review and updates for the current period, FY 2022/23.

Key Staff: Amy White, Assistant Planner
Andy Newsum, Deputy Director

## Appendix VI – Annual ASP Review Summary

**Annual ASP Review Completion/Approval Date: 8/25/2022**

| Location | Change/Comment |
|---|---|
| Title Page | Updated document title |
| | Added clarification of PTASP final rule above board adoption date |
| Multiple Pages | Edited font size, styles and headings to be consistent throughout document |
| Table of Contents | Added sections and renumbered pages as needed to match changes in sections of the body of document |
| | Updated terms to reflect correct ASP/SPT terms |
| | Retitled Appendix VI |
| | Removed page numbers referenced in appendix listing |
| Approvals | Approvals page not updated as this is a static signature page only for initial plan creation/approval |
| Annual Review Log | Added this page to create required recordkeeping support for the annual review process and to record and changes, updates, etc., to the ASP not associated with the annual review |
| Transit Agency Info & Staff | Updated CSO, Board Chair and added key staff to support new Bi-Partisan Infrastructure Law (BPIL) requirement of having frontline staff involved with development of the ASP. Updates to the ASP for this review cycle were given to Transdev for comment, etc. from their frontline staff |
| Multiple Locations: Terms and abbreviations | Updated references throughout document to correct terminology of ASP, PTASP and SPT and other abbreviations used for efficiency. Per FTA, PTASP always refers to the PTASP regulation and ASP refers to the agency's actual safety plan document/processes; Performance Targets should be designated Safety Performance Targets or (SPTs) per FTA guidelines |
| Pg 9 | Updated coordination with planning process section to clearly state BCAG is MPO for the designated urban area |
| Pg 11 | Updated part 4 – Key Staff – to reflect and support new BPIL requirement of frontline staff involvement |
| | Updated org chart to better clarify Accountable Executive (AE) designation outlined in part 1 under "Responsibilities" on page 10 – only one AE can be listed per FTA |
| Pg 14 | Changed Safety Plan Records section (c) second part or sentence to… "and the overall Public Transportation Agency Safety Plan final rule." |
| Pg 15 | Corrected spelling of superseded |
| Pg 16 | Re-formatted section "Scope" to make it 1.1.2 and "communication" section became 1.1.3 |
| Pg 20 | Added section 33 – definition of a Metropolitan Planning Organization (MPO) as it was used throughout the document but never clearly defined per FTA standards |
| Pg 21 | Updated definition 46 – PTASP – to clarify ASP versus PTASP per FTA regulation |
| Pg 23 | Clarified performance targets as safety performance targets and |

| | |
|---|---|
| | referenced methodology for SPTs |
| | Added "of plan purpose and activity" to heading 1.5 to clarify from heading 1.1.2 |
| Pg 36 | Added language to the second paragraph under section 4.3 to meet BPIL requirement of addressing strategies to mitigate exposure to infectious diseases to make it more explicit since it is already an element of the plan in general |
| Pg 41 | Converted audit schedule list into a table |
| Pg 48 | Added section 5.3.2 Safety Performance Targets to clarify process for development and refer to Appendix V for full discussion of SPTs |
| | Renumbered ASP review section to 5.3.2 |
| | Moved previous single sentence to within first paragraph pf section re ongoing review |
| | Removed reference to September in part a. as it becomes part of timeline table |
| Pg 49 | Added table to clarify and detail BCAG/B-Line's annual ASP review process as it was not previously defined; clarifies that Board mtg in Oct meets requirement of notifying the MPO of updates and changes |
| Appendix 1 | Moved actual text into document – updated title to reflect what was in agenda |
| | Added graphic of minutes showing board approval of ASP |
| Appendix 2 | Added text referencing JPA & By-laws document that gives BCAG authority for transit – added instructions on how to request full document since it is not included in this Word version or the live PDF version – referenced agency websites for public to access for more information |
| Appendix 3 | Added table for fixed route and paratransit into actual document since not previously inserted – based data on Appendix III document format from H drive file in PTASP folder from 2020 |
| Appendix 5 | Re-formatted and edited section to clearly reflect agency is following guidance from the FTA for formulas and methods to set and monitor SPTs for each of the four required categories – updated table to reflect current performance targets |
| Appendix 6 | Removed previous FTA TAC ASP review annotations and corrections document as those were addressed in the original ASP – FTA review document does remain intact on local drive and original documentation |
| | Added ASP review summary section – this section can be used as a tool for record keeping of the annual review process, including presenting to frontline staff for collaboration and the AE and Board for approval |

# Butte County Association of Governments

# Board of Directors Meeting
## ITEM #8

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BCAG BOARD OF DIRECTORS

**Item #8**
**Consent**

August 25, 2022

**APPROVAL OF SOCIAL SERVICES TRANSPORTATION ADVISORY COUNCIL (SSTAC) APPOINTMENTS**

**PREPARED BY:** Victoria Proctor, Assistant Transit Planner

**ISSUE:** Appointments to the BCAG Social Services Transportation Advisory Council (SSTAC) are required to be approved by the BCAG Board of Directors.

**DISCUSSION:** The attached roster identifies all members of the SSTAC and lists the categories that are required by the Transportation Development Act, Section PUC 99238.

The SSTAC is required under the Transportation Development Act (TDA) to work with staff during the annual unmet transit needs process. The purpose of the SSTAC is to review testimony obtained through public workshops conducted during the annual unmet transit needs process, and to provide the BCAG Board of Directors with an unmet transit needs finding. The SSTAC also provides a forum to address other issues facing transportations' disabled citizens. The BCAG Board may make at-large appointments at any time.

A call for applicants was advertised in local newspapers in June 2022 as well as on the BCAG website, social media pages and the B-Line buses.

**STAFF RECOMMENDATION:** Staff recommends the Board approve the appointments of Talmadge (Goldie) House (Disability Action Center), Linda Cartier (Citizen-Chico), and Mary Neumann (Passages) as identified in the attached roster.

Key Staff: Victoria Proctor, Assistant Transit Planner
Amy White, Assistant Transit Planner
Cheryl Massae, Human Resources Manager

**Butte County Association of Governments**
**2022-2023 Social Services Transportation Advisory Council**

| Name | Agency | Category Filled | | | | | | | Term ends |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Debra Connors | Citizen-Chico | | x | | | | | | June 30, 2023 |
| Marta De Los Santos | Mains'l Services Inc. | | | x | x | x | | | June 30, 2023 |
| Kristy Malloy | Paradise Medical Group | | | x | | x | | | June 30, 2023 |
| W. Jay Coughlin | Butte County DESS | | | | | x | | | June 30, 2023 |
| David Wilkinson | Citizen - Chico | x | x | | | | | | June 30, 2024 |
| Jeannie Schroeder | Mains'l Services Inc. | | | x | x | x | | | June 30, 2024 |
| Michael Harding | We Care A lot Foundation/FNRC | | x | x | x | | | | June 30, 2024 |
| Ron Ullman | Citizen - Oroville | x | x | | | | | | June 30, 2024 |
| Tara Sullivan Hames | Butte 211 | | | x | x | x | | | June 30, 2024 |
| Talmadge (Goldie) House | Disability Action Center | x | x | x | | | | | June 30, 2025 |
| Linda Cartier | Citizen-Chico | x | x | | | | | | June 30, 2025 |
| Mary Neumann | Passages | | | | | | x | | June 30, 2025 |

**<u>Category Listings as per PUC Section 99238</u>**

1 - potential transit user who is 60 years of age or older
2 - potential transit user who is disabled
3 - representatives of the local social service providers for seniors
4 - representatives of local social service providers for the disabled
5 - representatives of local social service provider for persons of limited means
6 - representatives from the local consolidated transportation service agency
7 - at-large appointment

* Citizen nominated by a Jurisdiction

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

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BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
# ITEM #9

# BCAG BOARD OF DIRECTORS

**Item #9**
**Information**

August 5, 2022

**2022 BCAG FEDERAL AGENDA PROGRAM**

**PREPARED BY:** Jon Clark, Executive Director

**ISSUE:** BCAG has maintained a contract with The Ferguson Group (TFG) since 2007/08 to assist our agency on working with federal transportation agencies and our congressional delegates to obtain additional federal funding for regional transportation projects and studies.

**DISCUSSION:** BCAG has worked with the Ferguson Group (TFG) since the 2007/08 Fiscal Year on development and coordination of a federal legislative platform which seeks to obtain additional federal funding for regional transportation projects and studies. BCAG's legislative platform is coordinated with the County of Butte who participates in the contract with TFG.

Attached for the BCAG Board of Directors review and comments is the 2022 Regional Legislative Platform.

This Regional Legislative Platform identifies the current project and program priorities for the Butte County region which include Disaster Recovery, Public Safety, Community Support, Land Use and infrastructure and other Governmental Functions.

Current transportation projects which BCAG is seeking additional funding for include the extension of daily rail passenger rail service to Butte County (*North Valley Passenger Strategic Plan*), battery electric buses and charging infrastructure for the B-Line fleet, the Colby Mountain Recreational Trail project, and other regional transportation projects and studies.

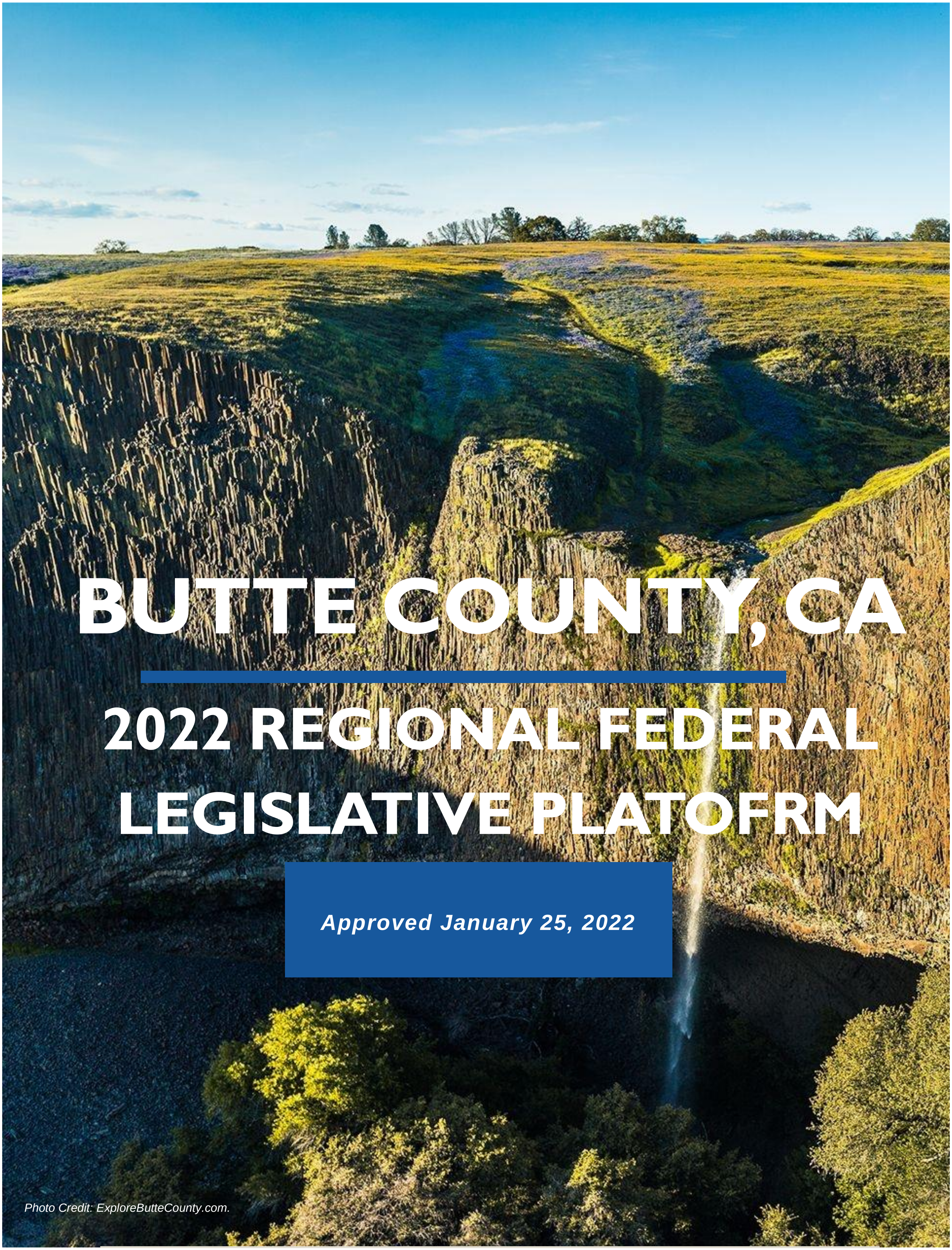
To date, TFG has helped BCAG obtain **$37** million in discretionary funding for the following regional projects:

- Forest Highway 171 Widening Project **- $19,000,000**
- Butte Regional Transit Maintenance & Operations Facility **- $18,000,000**

Over the next fiscal year, BCAG staff will work with Kristi More our representative with The Ferguson Group on developing lobbying materials for our current projects and identify funding needs for ongoing planning, project development and construction. Staff will also work with the Ferguson Group to schedule meetings with the appropriate federal transportation agencies and legislative representatives to discuss our projects and funding needs.

**STAFF RECOMMENDATION**: This item is presented for information and discussion.

Key Staff: Jon Clark, Executive Director
Andy Newsum, Deputy Director

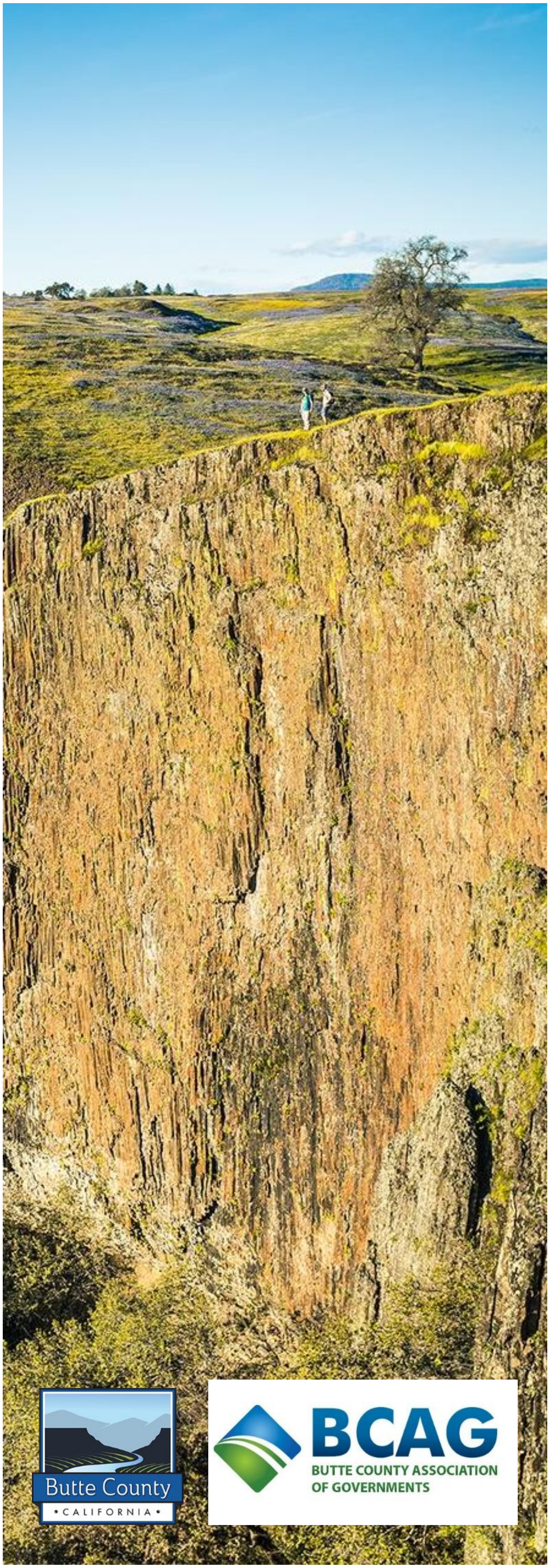


# BUTTE COUNTY, CA

# 2022 REGIONAL FEDERAL LEGISLATIVE PLATOFRM

***Approved January 25, 2022***

*Photo Credit: ExploreButteCounty.com.*




# BUTTE COUNTY BOARD OF SUPERVISORS

**Bill Connelly**
District 1

**Debra Lucero**
District 2

**Tami Ritter**
District 3

**Tod Kimmelshue**
District 4

**Doug Teeter**
District 5

*Andy Pickett*
*Chief Administrative Officer*

# BCAG BOARD OF DIRECTORS

**Bill Connelly**
Butte County

**Debra Lucero**
Butte County

**Tami Ritter**
Butte County

**Tod Kimmelshue**
Butte County

**Doug Teeter**
Butte County

**John Busch**
City of Biggs

**Kasey Reynolds**
City of Chico

**J. Angel Calderon**
City of Gridley

**Chuck Reynolds**
City of Oroville

**Jody Jones**
Town of Paradise

*Jon Clark*
*Executive Director*

# OVERVIEW

Over the last several years, the communities of Butte County have experienced multiple declared federal disasters including droughts, floods, fires, and pandemics. Through all of this, the County continued to provide essential services to our residents including unfailing law enforcement and fire protection; supportive mental health, behavioral health, and public health services; dependable infrastructure construction and maintenance; and reliable building and community services. The large number of survivors and the need to provide housing in jurisdictions outside of the burn areas has led to populations in cities within Butte County growing to sizes not anticipated for another 10 years. While recovering from the disastrous events that are beyond our control remains one of the County's top priorities, ensuring we continue to provide the essential services our residents rely on remains critical. Through the Regional Federal Legislative Platform, the County will advocate for federal assistance in five major areas, including:

*Photo Credit: Butte County*

### Disaster Recovery

Commit to the mitigation, preparation, and recovery of our communities before and after natural disasters.

*Photo Credit: Butte County*

### Public Safey

Provide reliable law enforcement, fire, and emergency management services.

*Photo Credit: ExploreButteCounty.com.*

### Community Support

Provide our residents the resources they need to overcome challenges.

*Photo Credit: Butte County Association of Governments*

### Land Use and Infrastructure

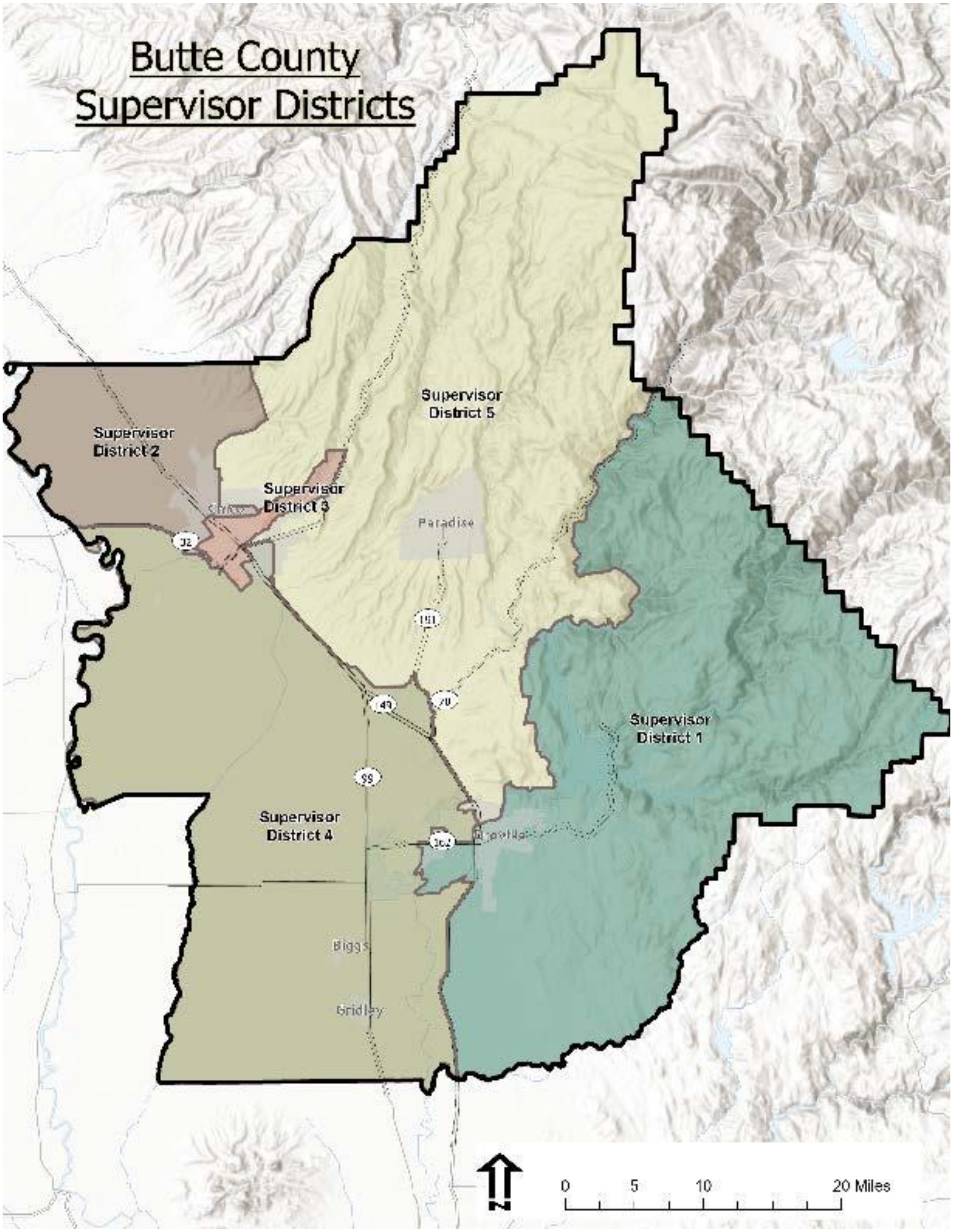
Support smart economic growth and reliable infrastructure.

*Photo Credit: ExploreButteCounty.com.*

### Other Governmental Functions

Support our communities as a whole.

# MAP OF BUTTE COUNTY



# DISASTER RECOVERY

Over the past five years, the communities of Butte County have experienced several declared federal disasters, including a record-setting drought, the Oroville Dam Spillway Failure and related flooding from an "Atmospheric River", and multiple wildfires including the Wall Fire, the Ponderosa Fire, the Wind Complex Fire, and the Camp Fire, the most destructive wildfire in the nation in the past 100 years. Then, in 2020, more disasters hit. Not only did Butte County respond to its communities and residents through unprecedented public health and economic turmoil caused by the world-wide coronavirus pandemic, but the County was hit with yet another devastating wildfire. The North Complex Fire destroyed 2,300 structures, including over 1,500 homes, and burned approximately 125,000 acres in Butte County. Impacts of these disasters, including unanticipated costs that could go on for years and reduced local revenues in the form of property taxes, sales taxes, transient occupancy taxes, and franchise fees, are only exacerbated as the multiple successive disasters layer upon each other.

- Disaster Funding

- Support additonal federal funding for agencies and programs to aid disaster recovery.
- Support legislation that waives the local share of cost of all emergency response and disaster recovery activities.
- Advocate for funding with minimal cost share for infrastructure projects destroyed, damaged, or impacted by natural disasters.
- Advocate for allocation of economic stimulus and disaster relief funding related to the coronavirus pandemic directly to local governments, small businesses, community organizations, and special districts.

# DISASTER RECOVERY

## •Housing and Survivor Benefits

- Support funding that assists with expedient construction of diverse housing stock in Northern California.
- Advocate for funding for all displaced individuals, including those who lost access to housing due to secondary displacement.
- Advocate for access to full benefits for all evacuees, survivors, individuals, and businesses impacted by declared disasters.
- Support legislation and policies that allow survivers and other residents to rebuild homes safely while also maintaining access to affordable and fair homeowners' insurance.
- Support programs that provide assistance to residents and businesses for the displacement and care of pets and livestock.

## •Recovery and Response

- Support legislation to repair roads to pre-disaster condition.
- Support legislation that funds water quality monitoring in communities impacted by wildfires, flooding, or other natural disasters.
- Support legislation to fund end-market solutions for timber and greenwaste.
- Support funding to assist residents with post traumatic stress disorder and other mental related illnesses stemming from the numerous disasters hitting our region.
- Support policies and programs, including providing funding for staff and personnel training, that provide access to additional social services for residents after disasters.
- Support programs that provide funding for public health planning activities in advance of a disaster, instead of just post-disaster.
- Support policies that require federal fire firghting agencies to coordinate directly with state and local fire fighting agencies to collectively respond to wildfire events in a coordinated manner.
- Support policies that allows FEMA to remove post disaster debris from federal lands.
- Support policies that require close coordination between all federal agencies and departments responsbile for post disaster recovery and response activities.
- Support policies that enable disaster response activities to accomodate for the unique circumstances of the impacted community.

# PUBLIC SAFETY

Butte County endeavors to provide safe communities for its residents. To this end, the County focuses on ensuring that all communities are protected from public safety threats and have access to critical safety services. We also strive to ensure we support our residents in their everyday lives by providing reliable law enforcement, fire and emergency management services.

## •Forest Management

- Support federal assistance for improved forest management and fuel reduction, including fire breaks, logging, grazing, biomass, biochar, reforestation and other creative solutions.
- Pursue legislative and regulatory changes to address tree mortality on federal lands.
- Support legislation and policies that assist local and state agencies in establishing fire mitigation activities, protocols, and programs.

## •Wild Fire Protection and Prevention

- Monitor and track federal assistance opportunities for wildfire protection and prevention programs.
- Support funding for the expansion of necessary evacuation routes throughout the County.
- Support new emerging technologies that assist emergency managers with key decision making tools.

## •Emergency Preparedness and Disaster Planning

- Support legislation that provides funding for local emergency and disaster planning, response, and recovery planning and efforts.
- Support legislation to broaden eligible mitigation projects and provide mitigation funding
- Support legislation and funding for expanding and increasing evacuation routes or evacuation points, especially for communities with only one way in and out.
- Support funding for counties to maintain regularly needed critical services and to provide for higher demands on health, social services, and behavioral health departments in the aftermath of emergencies.

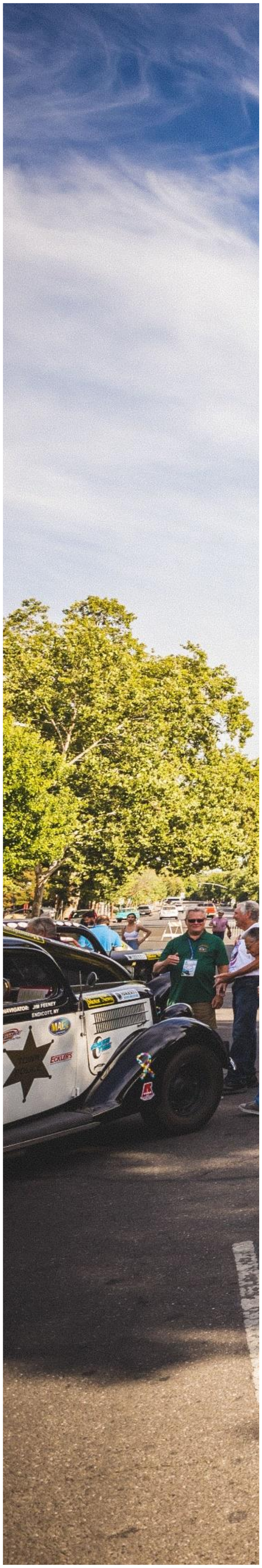
# PUBLIC SAFETY

## •Public Safety Facilities, Equipment, and Personnel

- Support funding for construction and rehabilitation of public safety facilities, including but not limited to: the jail, evidence storage, morgue, a forensic computer center, new Probation facility and fire stations.
- Pursue funding for public safety equipment, technology, training, and personnel.

## •Incarceration Impacts

- Support full funding for states and counties of costs associated with incarcerating undocumented individuals for the federal government.
- Oppose legislation which imposes adverse actions for incarcerated undocumented individuals.



# COMMUNITY SUPPORT

One of Butte County's goals is to ensure the way of life our residents love so much is not impacted by the challenges of today or the changes of tomorrow. We strive to ensure our residents have access to safe and affordable housing and are supported by a robust local economy and workforce. Butte County understands that many of our residents, including our youth, face a variety of challenges related to mental health, drug and alcohol abuse, homelessness, and gangs. The County strives to provide our populations in high risk with the services they need to overcome these challenges.

## •Housing

- Support programs and funding to provide housing and support services for all populations that also maintain decision making at the local level.
- Support programs that provide for diverse housing, including but not limited to affordable, market rate, transitional, and treatment based housing.
- Support services for individuals who are experiencing homelessness.
- Support programs that connect housing to transportation, employment centers and educational institutions.

## •Health and Well Being

- Support affordable health care for all individuals.
- Monitor key provisions of the Patient Protection Affordable Care Act related to County programs.
- Support mental health, drug, and alcohol services for the County's adult and youth populations in high risk environments.
- Support funding and local planning initiatives for regional mental health facilities.
- Advocate for funding of senior care and service programs including those authorized under the Elder Care Act.
- Support child welfare and child support programs that benefit the physical, mental, and financial well-being of children, including those in foster care.
- Pursue funding for juvenile justice programs for the County's youth in high risk situations.
- Pursue funding for staff and operations of the Drug Endangered Children Program.
- Support funding for the development of regional med-psych and psychiatric facilities to assist individuals with severe mental illness.
- Reform 42CFR to mirror HIPAA which would allow more communication and collaboration between healthcare providers and SUD providers.
- Support programs and funding that address prevention of chronic disease and promotion of overall wellness, including nutrition, food shortages, insecurity and hunger.
- Support programs and funding that provide resources, including testing, to Public Health officials to respond to outbreaks of communicable diseases within the community.

# COMMUNITY SUPPORT

## •Economic and Workforce Development

- Support federal tax incentive programs that encourage private investment in public facilities and projects.
- Support existing, comprehensive programs and pursue additional funding for workforce and economic development, and infrastructure improvements to serve business development and expansion in the County.
- Support programs that provide assistance to local communities and economies struggling with supply line issues, including providing incentives for local food supply programs.

## •National Flood Insurance Program

- Monitor legislation pertaining to FEMA flood zone mapping and the reauthorization of the National Flood Insurance Program (NFIP).
- Support policies that ensure the NFIP remains affordable for residents and businesses.

# LAND USE AND INFRASTRUCTURE

Smart economic expansion, growth, and sustainability are priorities for Butte County. The County strives to enhance the local economy to support our residents today while providing them with new opportunities for the future.  Regional planning provides a strategy that will lead to prosperity within the region for all local jurisdictions and helps provide for organized future growth and the public services that will need to be established to accommodate that growth. Upgrading and maintaining our roads, water supply, flood, and wastewater infrastructure not only helps the County provide basic services to our current residents, but it helps provide the foundation for future economic growth and business development. A large portion of Butte County is either located in the regulatory floodplain or is protected by public flood protection infrastructure. To ensure that residents remain protected, the status of the County's flood control infrastructure remains a top priority.

## •Transportation

- Support funding for improvements to the Highway 70 corridor to enhance economic development and public safety.
- Support funding and programs for the maintenance and construction of local roads and transportation infrastructure, including emergency evacuation routes and a rail system that travels through our region.
- Support funding for the maintenance of the right of way of local roads to keep free of fire fuel sources.
- Support funding for maintenance of haul roads due to tree and debris removal from disasters.

## •Water and Wastewater

- Support funding and programs that improve wastewater infrastructure projects throughout the County.
- Support funding for water supply infrastructure projects and programs that naturally increase the reliability and efficiency of the County's groundwater and surface water supplies.
- Support funding for projects and programs that naturally recharge of our basins.
- Support the preservation of water rights, area of origin, and local control of land use and water management.

## Flood Issues

- Support the Sutter-Butte Flood Control Agency's effortrs to ensure flood protection in Butte County.
- Support funding for the development of projects identified in the Mid-Upper Sacramento River Regional Flood Management Plan.
- Engage with Corps of Engineers on certifcation and matinenance of levees througout the County.
- Support programs and funding to prepare and mitigate areas prone to seasonal flooding.

# LAND USE AND INFRASTRUCTURE

## •Planning

- Support approval and implementation of the Butte Regional Conservation Plan.
- Support funding for projects and programs included in the Northern Sacramento Valley and Upper Feather River Integreated Regional Water Management Plan.
- Support policies and regulations that streamline federal regulatory and environmental processes to expedite delivery of planning and construction projects in a way that does not compromise environmental laws.
- Support programs that provide funding for planning and pre-project activities for all types of infrastructure including transportation, water, wastewater, and broadband.

## •New License Process for the Oroville Project

- Engage the congressional delegation, relevant congressional committees, and the Administration supporting a new license process of the Oroville Project which addresses reimbursement of local costs associated with providing services to the Oroville Project, safety concerns, and recreation concerns as well as lost property tax revenue.

## •Public Facilities , Parks, Museums, and Libraries

- Support funding for veteran facilities and programs including veterans memorial halls, 900 Esplanade, and the Veterans Memorial Park.
- Support funding for community facilities and programs throughout the County including parks, libraries, community centers, government support buildings, a new Emergency Operations Center, a new County Jail, and the County fairgrounds.
- Support funding to increase the energy efficency of public buildings and facilities.

## •Public Access to Federal Lands

- Support polices that preserve and enhance public access to federal lands for diverse purposes, such as off-road vehicle use, general recreational activites, wood cutting, dispersed camping, and grazing rights.
- Support establishment of evacuation routes on federal lands.
- Support uniformity of rule application across national forests.
- Support least restrictive, versus most restrictive, rules to protect endangered species.

## •Agriculture

- Oppose federal regulations and legislation that negatively impact the agricultural industry in Butte County.
- Support additional funding and track regulations for the detection and control of various invasive pests harmful to agriculture in California.
- Support changes to the National Flood Insurance Program that create regulatory relief for agricultural areas and rural communities located in the floodplain.

## •Marijuana/Cannabis Related Issues

- Monitor and track legislation and policy related to commercial marijuana/cannabis activities and cultivation for personal use.
- Support federal policies that provide direction to federal agencies and local governments on the regulation of land use and environmental impacts associated with commercial marijuana/cannabis activities, including cultivation.

# OTHER GOVERNMENTAL FUNCTIONS

Butte County is also engaged in several other initiatives that have broad impacts to our communities and residents.

## Climate Change Impacts

- Support legislation that will provide emergency economic assistance to Butte County to address localized drought impacts.
- Oppose legislation that would result in changes to water right priorities and/or weakening of environmental standards in the Delta.
- Support funding for forest management and wildfire prevention.

## Communications and Broadband

- Support funding for public telecommunications, radio, and broadband infrastructure and technology, including advancments to increase the redundancy of public safety communications.
- Seek support for broadband funding for rural communities.
- Support legislation and policies that maintain local control of the deployment of telecommunication technologies.
- Support programs that expand the use of GIS and GPS technologies for community and emergency response planning.

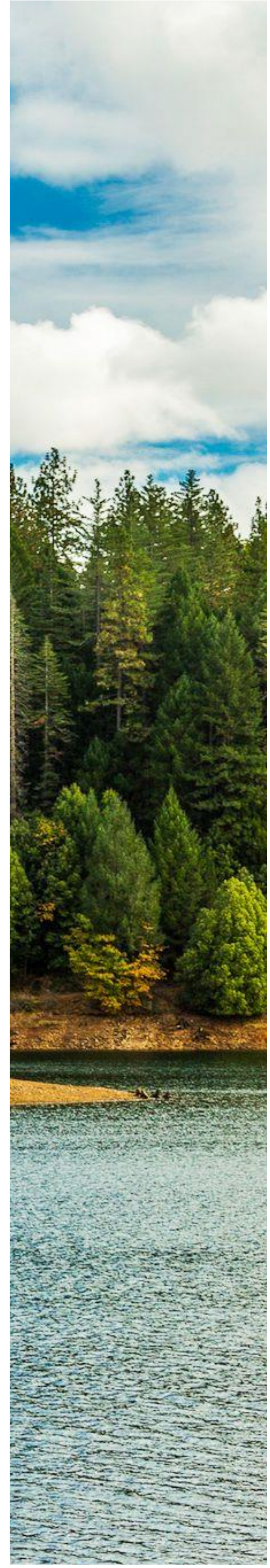
## Tribal Issues

- Monitor and track policy initiatives and legislation pertaining to casino development on tribal lands.
- In order to address critical problems in the existing fee-to-trust process, support legislation to better define the roles of Congress and the executive branch, establish clear and specific congressional trust acquisition standards, and create a more transparent process.

## Election Reform

- Monitor and track legislation pertaining to local election regulations and processes.
- Support federal initiatives that provide funding for reform and equipment that bring efficiencies to the election process.

# OTHER GOVERNMENTAL FUNCTIONS



## Cybersecurity

- Support funding and programs for cybersecrurity services, training, and equipment.

## Protection of Local Revenue

- Oppose any federal effort to borrow, defer, or take local discretionary revenue.
- Oppose the redirecting of existing revenues and/or the creation of additional unfunded mandates.
- Support efforts to generate new intergovernmental revenue and/or enhance existing revenue and reimbursement levels.
- Support programs and initiatives that offset the loss of revenue on publically managed lands including the Secure Rural Schools and Payment In Lieu of Taxes programs.

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
# ITEM #10

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## BCAG BOARD OF DIRECTORS

**Item # 10**
Information

August 25, 2022

**B-LINE ADVERTISING UPDATE**

**PREPARED BY:** Sara Cain, Senior Planner

**ISSUE:** Staff is providing an update on exterior advertising of the B-Line fleet.

**DISCUSSION:** B-Line has an agreement with Lamar Transit, LLC for the management of advertising on buses, bus stops, and maintenance of bus stops. At the May 26, 2022 Board of Directors meeting, the agreement with Lamar was amended to expand the advertising from the already utilized tails of the buses to the sides of the buses. The expansion of advertising will help generate resources to fund necessary improvements to stops throughout the system.

Staff is providing an update to the Board on the first full size ad as part of the expanded advertising agreement. The image below is the first partnership with a local Butte County Company, Atta Boy Plumbing, that was installed on August 17.


**STAFF RECOMMENDATION:** This item is presented for information.

Key Staff: Sara Cain, Senior Planner
Andy Newsum, Deputy Director

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
ITEM #11

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BCAG BOARD OF DIRECTORS

**Item #11**
**Information**

August 25, 2022

**DRAFT 2023 FEDERAL TRANSPORTATION IMPROVEMENT PROGRAM (FTIP)**

**PREPARED BY:** Ivan Garcia, Transportation Programming Specialist

**ISSUE:** The draft 2023 Federal Transportation Improvement Program (FTIP) has been prepared and is available for public review. The BCAG Board of Directors is scheduled to adopt the 2023 FTIP on September 22, 2022.

**DISCUSSION**: As the federally designated Metropolitan Planning Organization for Butte County, BCAG is responsible for biennially preparing and adopting the FTIP.

The purpose of the FTIP is to identify all transportation-related projects that require federal funding or other approval by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA). The 2023 FTIP will cover the next four fiscal years beginning on October 1, 2022 (FFY 23/23, 23/24, 24/25 and 25/26). The FTIP also identifies all non-federal, regionally significant projects for information and air quality emissions modeling purposes. The FTIP indicates the area's short-term plan for use of federal dollars and other resources for the maintenance, operation, and improvement of the transportation system and the achievement of federal air quality standards over the next four federal fiscal years.

**The 2023 FTIP identifies approximately $195.7 million in transportation funding for 21 projects.** The attached Table 1–2023 FTIP Summary identifies the projects by agency, fiscal year, and fund source. In addition, BCAG is also identifying the performance measure the project achieves. The performance measures include Performance Measure 1 – Safety; Performance Measure 2 – Pavement and Bridge; and Performance Measure 3 – Freight & Congestion.

The 2023 FTIP was developed in consultation with the required state and federal agencies, and BCAG's transportation advisory committee. Development of the FTIP has been completed in accordance with BCAG's adopted Public Participation Plan. Once adopted, the BCAG Board may amend the FTIP at any time.

All projects in the FTIP are required to be consistent with and included in the Regional Transportation Plan/Sustainable Communities Strategy adopted by the BCAG Board in December 2020. A complete FTIP Document is posted at BCAG's webpage at: http://www.bcag.org/Planning/FTIP/index.html.

The FTIP also includes an Air Quality Conformity Determination which has been distributed to BCAG's Interagency Consultation Review group comprised of Caltrans, FHWA, FTA and EPA for final review and comment prior to Board adoption.

A second public workshop is scheduled for Thursday, August 4, 2022 via zoom.

FTIP Zoom Workshop

Thursday, August 4, 2022
4:00 p.m. – 5:00 p.m.
https://us02web.zoom.us/j/87956716075?pwd=NklZdmhRaXVyOVlUV09pZFdDVExlZz09
Meeting ID: 879 5671 6075
Passcode: 285251
One tap mobile
+16699006833,,87956716075#,,,,*285251# US

A public notice has been placed in the local newspaper, BCAG website and the B-Line Transit Fleet informing the public of its availability for review and comment. A hard copy of the complete FTIP document will be available at the Board meeting.

**STAFF RECOMMENDATION**: This item is presented for the Board's awareness. The final FTIP will be presented for adoption at the September 22, 2022 Board meeting.

Key staff: Ivan Garcia, Programming Director
Brian Lasagna, Regional Analyst

Summary of 2023 FTIP by Agency, Fund Type and Performance Measure Achieved

| | AGENCY | Title | Local Funds | RIP-State | RIP-Fed | SHOPP | FTA Funds | CMAQ | HBP | HSIP | ATP | CRRSAA | TOTALS | PM 1 Safety | PM 2 Pavement & Bridge | PM 3 Freight, Congestion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Biggs | Biggs 2nd Street Bicycle/Pedestrian Improvements | 100 | 88 | 400 | | | | | | | 12 | 600 | X | | X |
| 2 | County | Central House Rd Ovedr Wymann Ravine Bridge | | | | | | | | | | | | | X | |
| 3 | BCAG | B-Line Zero Emission Bus Rollout | | | 2,500 | | | | | | | | 2,500 | | | X |
| 4 | BCAG | FTA Sec. 5307 Program - B - Line | 16,300 | | | | 16,300 | | | | | | 32,600 | | | X |
| 5 | Various | FTA 5310 Enhancement Program Group Listing - Non Infrastructure | | | | | 950 | | | | | | 950 | | | X |
| 6 | BCAG | FTA Sec 5311 Program | 2,921 | | | | 4,260 | | | | | | 7,181 | | | X |
| 7 | BCAG | FTA 5311f - Butte Regional Transit | 1,014 | | | | 1,200 | | | | | | 2,214 | | | X |
| 8 | Caltrans | Grouped Projects for Safety Improvements - SHOPP Collision Reduction Program | | | 500 | 6,915 | | | | | | | 7,415 | X | | |
| 9 | Caltrans | Grouped Projects for Bridge Rehabilitation and Reconstruction - SHOPP Bridge Program | | | | 3,885 | | | | | | | 3,885 | | X | |
| 10 | Caltrans | Grouped Projects for Emergency Repair - SHOPP Emergency Response Program | | | | 5,810 | | | | | | | 5,810 | X | | |
| 11 | Caltrans | Grouped Projects for Pavement resurfacing and/or rehabilitation - SHOPP Roadw ay Preservation | 400 | | 3,100 | 77,120 | | | | | | | 80,620 | | X | |
| 12 | Caltrans | SHOPP Minor | | | | 500 | | | | | | | 500 | | X | |
| 13 | Chico | SR 99 Southgate Interchange PE Only Project | 1,200 | | | | | | | | | | 1,200 | X | | X |
| 14 | Chico | North Esplanade Reconstruction Project | 6,800 | | 5,000 | | | | | | | | 11,800 | X | | X |
| 15 | Chico | Guynn Rd over Lindo Channel Bridge Project | | | | | | | 150 | | | | 150 | | X | |
| 16 | Chico | Esplanade Corridor Safety and Accessibility Improvement Project | | | | | | 675 | | | 6,235 | | 6,910 | X | | X |
| 17 | Chico | Bruce Rd Bridge Replacement Project | 7,145 | | | | | | | | | | 7,145 | X | X | X |
| 18 | Chico | Hegan Lane Business Park Access Improvements | 12,486 | | | | | 2,014 | | | | | 14,500 | X | | X |
| 19 | Oroville | SR 162 Pedestrian/Bicycle Disabled Mobility and Safety Improvements Project | | | | | | | | | 3,411 | | 3,411 | X | | X |
| 20 | Various | Grouped Projects for Bridge Rehabilitation and Reconstruction - HBP Program | 96 | | | | | | 386 | | | | 482 | | X | |
| 21 | Various | Grouped Projects for Safety Improvements - HSIP Program | 1,772 | | | | | | | 4,070 | | | 5,842 | X | | |
| | | Totals | **50,234** | **88** | **11,500** | **94,230** | **22,710** | **2,689** | **536** | **4,070** | **9,646** | **12** | **195,715** | | | |

## Performance Measures – Programming Summary

- PM 1 - Safety– $64.5 million
- PM 2 – Pavement and Bridge Condition – $92.78 million
- PM 3 – Freight Movement, Congestion and Reliability – $90.96 million

## Total 2023 FTIP Projects: $195.715 million

# BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# BOARD OF DIRECTORS MEETING
# ITEM #12

## BCAG BOARD OF DIRECTORS

**Item #12**
**Information**

August 25, 2022

**B-LINE MOBILE PAYMENT APP UPDATE**

**PREPARED BY:** Amy White, Assistant Planner

**ISSUE:** Staff is updating the Board on the progress of the B-Line mobile ticketing app, focused marketing and the creation of online portals for partnering organizations.

**DISCUSSION:** As the transit industry continues to direct efforts toward modernization of equipment, methods, and procedures, one area of focus for B-Line is the integration of the mobile ticketing application into the passenger experience. During FY 19/20, BCAG began working with Token Transit to develop a mobile fare app for passengers. The app, which went live in October 2020, enables riders to purchase, store and activate tickets on their smart phones.

Data from Token Transit reflects that the first month of usage in October 2020 generated 60 individual products sold (fares or passes) with a total value of $624.20. The last complete month of data from July 2022 shows that the use generated 870 individual products sold with a total value of $6,236.60. To date, the highest total value of sales through the app in any one month was $6,622.55 in April 2022. The month where the most individual products sold was May 2022 with 917.

While the increases are encouraging, the actual usage of Token Transit currently reflects about 9% of the total B-Line ridership month-to-month. Staff would like to see Token Transit use increase and have deployed several targeted marketing efforts to encourage riders to download and try the app.

### Marketing Efforts

In the spring of 2022, staff hosted several outreach events in Chico, Oroville, Paradise, Gridley and Biggs. These events focused on a few areas and staff used these opportunities to provide information on the Token Transit app and to assist people with getting it loaded onto their mobile devices. Data showed a subsequent increase in app use, especially in March 2022. Encouraged by this increase, staff is making Token Transit the focus of our outreach events for the remainder of the year, including at the Chico Downtown Market and the upcoming Salmon Festival in Oroville.

Staff have increased social media posts regarding the app and have made available a QR code going directly to the app. The QR code is promoted on handouts during outreach events as another way to connect riders with the app. Additionally, there is a "how to" video available on the B-Line website and You Tube page.

**Online Portals**

Another area of Token Transit engagement that staff currently works on is helping local agencies and organizations meet their program needs. Staff worked with Token Transit to add several web portals which will allow agencies flexibility with bulk purchasing, sending out passes and other user incentives. Far Northern Regional Center can load and send several types of products through their portal to address the various needs of their clients. Butte College needed a portal created for students residing in Paradise, who are eligible to get a fully subsidized 30-day pass. An additional portal may be added later to serve the general student population with discounted 30-day passes. Staff has also been in conversations with Chico Unified School District to develop a portal web page.

Our launch date for the Token Transit web-based portals is August 1, 2022.

**STAFF RECOMMENDATION:** This item is for information only.

Key Staff: Amy White, Assistant Planner
Victoria Proctor, Assistant Planner
Sara Cain, Senior Planner

# Butte County Association of Governments

# Board of Directors Meeting
# ITEM #13

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

## BCAG BOARD OF DIRECTORS

**Item #13**
**Action**

August 25, 2022

**ADOPTION OF 100% ZERO EMISSION BUS (ZEB) ROLLOUT PLAN TO COMPLY WITH CALIFORNIA AIR RESOURCES BOARD (CARB) INNOVATIVE CLEAN TRANSIT (ICT) REGULATION**

**PREPARED BY:** Andy Newsum, Deputy Director

**ISSUE:** BCAG is adopting a Rollout Plan for the transition to a 100% Zero Emission Public Transit Fleet by 2040 as required by the CARB ICT Regulation.

**DISCUSSION:** In response to the Innovative Clean Transit Regulation adopted on August 13th, 2019 by the CARB, BCAG entered in to an agreement with the Center for Transportation and the Environment (CTE) on April 13th, 2021 to complete a comprehensive study of the B-Line existing fleet fueling, facility and maintenance processes in an effort to compile multiple scenarios of zero emissions vehicle fleets that could be pursued to comply with the regulation.

Two (2) documents were produced by CTE:

- Zero Emission Bus Fleet Transition Study
- Zero Emission Bus Rollout Plan ***(To be adopted by the BCAG Board)***

Both documents are available on the BCAG website: http://www.bcag.org/Projects/Zero-Emission-Bus-Implementation/index.html

CTE described and detailed the capital and operational costs of pursuing four types of transition scenarios ranging in cost from $88 million to $110 million invested over an 18-year period (2040) are as follows:

- 100% Battery Electric Buses (100% BEB only)
- 75% BEB and 25% Hydrogen Fuel Cell (FCEB)
- 100% FCEB only
- 75% FCEB and 25% BEB

As expected, the least expensive scenario is the BEB only scenario. Achieving the magnitude of stated investment would require a significant contribution of local funding utilized to match existing and future state and federal grant funding opportunities. Current and increasing availability of electric technology seems to favor the pursuit of a 100% BEB fleet. However, the production of Hydrogen for use in fuel cells is becoming more readily available and may in fact be a preferred technology in the coming years.

Staff is committed to the development of a Zero Emission Bus Fleet using technologies that are available, affordable and sustainable and will continue to update the Board as capital acquisitions and implementation of service moves forward.

**STAFF RECOMMENDATION:** Staff requests the Board adopt Resolution No.2022-22-03 approving the "*Zero Emission Bus Rollout Plan*" for Transition to a 100% Zero Emission Public Transit Fleet by 2040 in compliance with the CARB ICT Regulation.

Key Staff: Andy Newsum, Deputy Director
Jon Clark, Executive Director
Sara Cain, Senior Planner

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# Zero-Emission Bus
# **Fleet Transition Study**

Presented by Center for Transportation and the Environment

August 2022

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# List of Acronyms

| | |
|---|---|
| A&E | Architecture and Engineering |
| BCAG | Butte County Association of Governments |
| BEB | Battery Electric Bus |
| BROC | Butte Regional Operations Center |
| CARB | California Air Resources Board |
| CTE | Center for Transportation and the Environment |
| CI | Carbon Intensity |
| DOE | Department of Energy |
| DGE | Diesel Gallons Equivalent |
| dHEB | Diesel Hybrid |
| EPA | Environmental Protection Agency |
| EV | Electric Vehicle |
| ESS | Energy Storage System |
| FCEB | Fuel Cell Electric Bus |
| FCEV | Fuel Cell Electric Vehicles |
| FTA | Federal Transit Administration |
| GHG | Greenhouse Gas |
| GVWR | Gross Vehicle Weight Rating |
| HVAC | Heating, Ventilation, and Air Conditioning |
| ICE | Internal Combustion Engine |
| ICT | Innovative Clean Transit |
| kW | Kilowatt |
| kWh | Kilowatt Hour |
| kWh/mi | Kilowatt-hour/mile |
| LCFS | Low Carbon Fuel Standard |
| MPO | Metropolitan Planning Organization |
| MW | Megawatt |
| MWh | Megawatt-hours |
| NFPA | National Fire Protection Association |
| OCTA | Orange County Transit Authority |
| OEM | Original Equipment Manufacturer |
| ROW | Right-of-Way |
| TOU | Time-of-Use |
| ZEB | Zero-Emission Bus |

# Executive Summary

Butte County Association of Governments (BCAG) engaged the Center for Transportation and the Environment (CTE) to perform a zero-emission bus (ZEB) transition study with the aim to achieve a 100% zero-emission fleet by 2040 to comply with the Innovative Clean Transit (ICT) regulation, enacted by the California Air Resources Board (CARB). The results of the study will inform BCAG of the estimated costs, benefits, constraints, and risks of the transition to a zero-emission fleet and will guide future planning and decision-making.

On December 14, 2018, CARB enacted the ICT regulation, setting a goal for California public transit agencies to have 100% zero-emission fleets by 2040. The ruling specifies the percentage of new bus procurements that must be zero-emission buses for each year of the transition period (2021– 2040). Those annual percentages are outlined in **Table 1** below.

*Table 1: ICT ZEB Percentage Requirements*

| Starting January 1 | Percent of New Bus Purchases for Small Agencies |
|---|---|
| 2026 | 25% |
| 2027 | 25% |
| 2028 | 25% |
| 2029 | 100% |

This schedule lays out a pathway to reaching 100% zero-emission fleets in 2040 based on a 12-year projected lifespan for a transit bus. BCAG has the opportunity to request waivers that allow purchase deferrals in the event of economic hardship or if zero-emission technology has not matured enough to meet the service requirements of a given route. These concessions recognize that zero-emission technologies may cost more than current internal combustion engine (ICE) technologies on a lifecycle basis and that zero-emission technology may not currently be able to meet all service requirements.

Zero-emission technologies considered in this study include battery-electric buses (BEB) and hydrogen fuel cell electric buses (FCEB). BEBs and FCEBs have similar electric drive systems that feature a traction motor powered by a battery. The primary differences between BEBs and FCEBs are the respective amount of battery storage and the method by which the batteries are recharged. The electric drive components and energy source for a BEB and FCEB are illustrated in **Figure 1.**

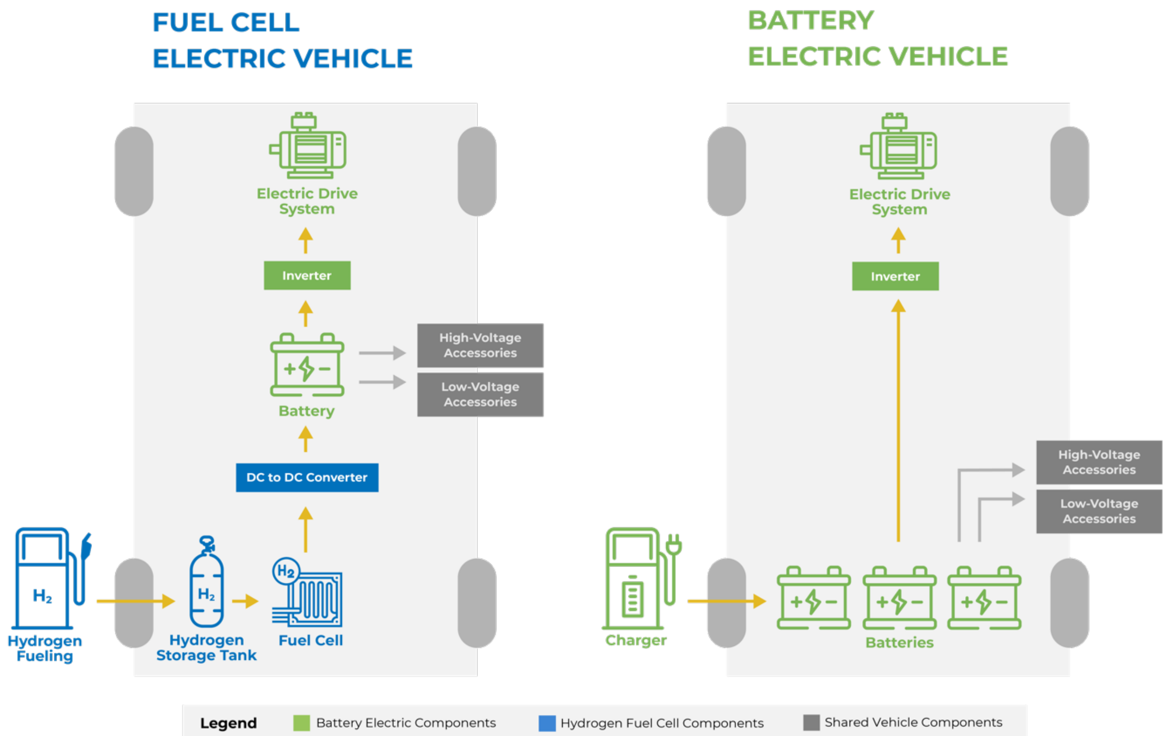


*Figure 1 - Battery and Fuel Cell Electric Bus Schematic*

CTE worked closely with BCAG staff throughout the project to develop an approach, define assumptions, and confirm the results. The approach for the study is based on analysis of four ZEB technology scenarios compared to a baseline scenario:

0. Baseline (current technology)
1. BEB Only
2a. Mixed Fleet - BEB Majority
2b. Mixed Fleet - FCEB Majority
3. FCEB Only

To accurately forecast service feasibility for each of these zero-emission technologies, CTE then assessed the block feasibility of BCAG's current service schedules. A block is the series of trips assigned to a single bus from the time of garage pull-out to its return pull-in, including deadhead, in-service hours, and layover. Block feasibility is determined by comparing the estimated energy required to operate a BEB on a given block to the usable onboard energy storage capacity of the bus. If the block energy requirement exceeds the usable onboard storage capacity, the block is considered unachievable. If the block energy requirement does not exceed the usable onboard storage capacity, the block is considered to be achievable. In order to calculate the block feasibility of BEBs, CTE modeled a market representative vehicle, which would have specifications that represent the average of the available vehicles in its class. Although not a zero-emission scenario, this study also includes a baseline scenario that is used to compare the cost of a ZEB transition to a "business-as-usual" case (i.e., without the need to meet ICT requirements).

The BEB-only scenario was developed to model an option with a fleet consisting entirely of battery electric buses that can meet existing service range requirements. Fleets consisting of BEBs that only charge at a depot may not be able to meet the range requirements of many routes and would require additional time to return to the depot to charge. According to CTE's modeling, BCAG's blocks are fully achievable with depot-charged BEBs by 2035. One drawback of a BEB-only fleet is that it may be less resilient than a mixed fuel fleet because interruptions to the power supply could jeopardize the operability of the fleet. This hurdle can be easily addressed by installing back-up power supplies and planning contingencies.

While the Feasibility Assessment determined that the range of market average BEBs would be sufficient to meet all of BCAG's service requirements, two mixed fleet scenarios were developed that allowed the agency to explore the cost and practicality of a BEB Majority fleet (75% BEB, 25% FCEB) and an FCEB Majority fleet (75% FCEB, 25% BEB). A mixed fleet is also more resilient to service interruptions if either fuel is temporarily unavailable. For agencies that operate only one depot, however, mixed fleets may present space constraints in order to host both infrastructure types in one depot. BCAG's facilities are not space constrained and are therefore able to accommodate the two technologies.

The FCEB-only scenario was developed to help identify benefits and mitigate challenges associated with switching the entire fleet to fuel cell technology. An FCEB fleet could replace diesel buses in a 1:1 ratio and avoids the need to install two types of fueling infrastructure. Additionally, hydrogen fueling infrastructure is less expensive at scale compared to a large-scale fleet transition to BEBs. And while hydrogen is a more expensive fuel than electricity at current market prices, applying a sensitivity analysis to hydrogen costs shows that it will likely become more competitive compared to the cost of electricity by 2040. A FCEB-only fleet, however, lacks the redundancy provided by having alternative technologies and fuel types in a mixed fleet, and current market prices for FCEBs are higher than BEBs.

The assessment follows CTE's ZEB Transition Planning Methodology, a complete set of analyses used to inform agencies planning the conversion of their fleets to zero-emission technologies. The methodology consists of data collection, analysis, and evaluation stages; these stages are sequential and build upon findings in previous steps. In the evaluation stage, CTE assesses energy efficiency and energy use by the buses to calculate the distance that a bus will be able to travel on a single charge or hydrogen fill. CTE collected sample data from multiple BCAG routes. Then, using market representative ZEB battery capacity specifications for given bus lengths, CTE estimated range and energy consumption on all BCAG routes and blocks under varying environmental and passenger load conditions. Once this information was established, CTE completed the following assessments to develop cost estimates for each of the scenarios.

The **Fleet Assessment** develops a projected timeline for replacement of current buses with ZEBs that is consistent with the agency's fleet replacement plan. This assessment also includes a projection of fleet capital cost over the transition lifetime and it can be optimized with regard to any state mandates, like CARB's ICT regulation, or to meet agency goals, such as minimizing cost or maximizing service levels. It should be noted that the assessment assumes buses are replaced with ZEBs of the same length as the ICE buses currently in operation.

The **Fuel Assessment** merges the results of the Service Assessment and Fleet Assessment to determine annual fuel requirements and associated costs. The Fuel Assessment calculates energy costs through the full life of the transition, including the agency's current ICE buses. As current technologies are phased out in later years of the transition, the Fuel Assessment calculates the increasing energy requirements for ZEBs. The Fuel Assessment also provides a total energy cost over the transition lifetime.

The **Facilities Assessment** determines the necessary infrastructure to support the projected zero-emission fleet based on results from the Fleet Assessment and Fuel Assessment. The Facilities Assessment is calculated to meet the fleet procurement schedules defined in the Fleet Assessment and the fueling capacity required based on the Fuel Assessment. The result shows quantities of hydrogen and battery electric infrastructure and calculates associated costs.

The **Redundancy, Resilience, and Emergency Response (3R) Assessment** investigates the new risks to an agency's ability to provide service during power outages or fuel disruptions and to support required emergency response activities, such as community evacuation with a full ZEB fleet. The outcomes of the 3R assessment are a summary of the risk reduction capabilities and cost effectiveness of the recommended alternatives to mitigate the impacts from identified risks specific to an agency's risk tolerances, facility constraints, and budget.

The **Maintenance Assessment** calculates all projected fleet maintenance costs over the life of the project. This includes costs related to existing ICE buses remaining in the fleet, as well as new ZEBs.

The **Total Cost of Ownership Assessment** compiles results from the previous assessment stages and provides a comprehensive view of all associated costs, over the transition lifetime. **Table 2** and **Figure 2** below provide a side-by-side comparison of the cumulative transition costs for each scenario. Since BCAG is already in the process of procuring 5 BEBs and will need to install chargers to support these vehicles, the Baseline scenario includes infrastructure costs although all ICE fueling infrastructure is assumed to already be installed.

*Table 2 - Total Cost of Ownership, by Scenario*

| | 0. Baseline (Current Technology) | 1. BEB Only | 2a. Mixed Fleet (BEB Majority) | 2b. Mixed Fleet (FCEB Majority) | 3. FCEB Only |
|---|---|---|---|---|---|
| **Fleet** | $35M | $45M | $50M | $55M | $57M |
| **Fuel*** | $24M | $21M | $24M | $26M | $27M |
| **Maintenance** | $15M | $13M | $15M | $17M | $18M |
| **Infrastructure** | $3M | $8M | $11M | $8M | $8M |
| **TOTAL** | **$ 76M** | **$ 88M** | **$ 101M** | **$106M** | **$ 110M** |

*Excludes any potential LCFS credit revenue; near-term costs with sensitivity analysis applied.

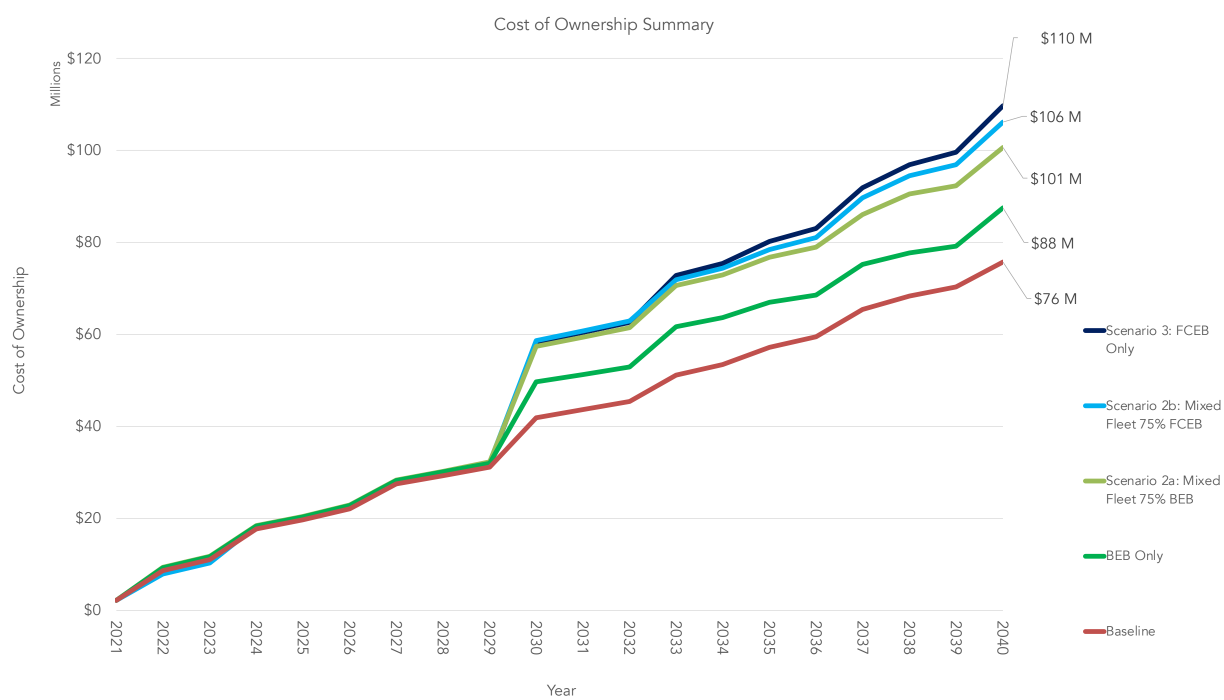


*Figure 2 - Total Cost of Ownership, by Scenario*

## ZEB Transition Scenario Overview

### 1. Battery Electric Bus (BEB) Depot Only Scenario

For an all-BEB fleet that charges exclusively at the depot, ZEB transition costs are likely to be $88 million where 100% of BCAG's fleet is replaced with BEBs by 2040 without adding additional buses. The difference in cost between the Baseline and BEB Depot Only scenario is the result of higher capital costs for battery electric buses compared to diesel buses and from the significant infrastructure investment necessary for charging infrastructure.

### 2a. Mixed Fleet: BEB Majority

In the BEB Majority Mixed Fleet, 75% of BCAG's fleet is composed of battery electric buses, with the remaining 25% made up of hydrogen fuel cell buses. The total cost of this scenario is estimated at $101 million. Though all of BCAG's routes are feasible with BEBs, the addition of fuel cell buses adds redundancy and resilience in potential emergency situations.

### 2b. Mixed Fleet: FCEB Majority

The FCEB Majority Mixed Fleet Scenario resulted in a total cost of approximately $106 million to replace BCAG's entire fleet with ZEBs by 2040. Though the costs are less for a mixed fleet deployment than for the FCEB Only deployment, there is the added complexity of installing infrastructure for both fuel types. Since BCAG has only one depot, the space constraint of installing both infrastructure types may be a challenge.

### 3. Fuel Cell Electric Bus (FCEB) Only Scenario

In the FCEB Only scenario, ZEB transition costs are estimated at $110 million to replace 100% of BCAG's fleet with FCEBs by 2040. A primary assumption for the FCEB Only scenario is that 30-foot fuel cell electric buses and fuel cell cutaways will become available during the transition period. It is expected that, due to the limited deployment of FCEBs in service in the United States, capital costs for these buses and hydrogen fuel costs will remain high in the near-term due to low market competition. This is expected to change, although more data is needed to adequately forecast these cost decreases. As such, this study uses current FCEB and infrastructure pricing for the entirety of the ZEB transition period.

For estimates of FCEB maintenance costs, CTE used data reported from Orange County Transit Authority's (OCTA) FCEB fleet of 10 New Flyer Xcelsior buses in their first year of operation. Fuel cell technology was new to OCTA and, as a result, the maintenance costs were higher than expected. OCTA does expect reductions in the long run. Given the necessary reliance on this early-adoption maintenance data, FCEB maintenance cost data has a wider margin of error than BEB cost estimates. More concrete data will become available, and costs will likely fall as a larger number of fuel cell electric buses and hydrogen infrastructure are deployed, however, significant investments in hydrogen infrastructure may take years to materialize.

## Project Risks

In addition to the uncertainty of technology improvements, there are other risks to consider in trying to estimate costs over the 20-year transition period. Although current BEB range limitations may be improved over time as a result of advancements in battery energy capacity and more efficient components, battery degradation may re-introduce range limitations, which is a cost and performance risk to an all-BEB fleet over time. In emergency scenarios that require use of BEBs, agencies may face challenges performing emergency response roles expected of them in support of fire and police operations. Furthermore, fleetwide energy service requirements, power redundancy, and resilience may be difficult to achieve at any given depot in an all-BEB scenario. Although FCEBs may not be subject to these same limitations, higher capital equipment costs and availability of hydrogen may constrain FCEB solutions. The costs and benefits of various alternatives to mitigate the risks of power outages, hydrogen disruptions, and natural disaster impacts were evaluated in the Redundancy, Resilience, and Emergency Response (3R) Assessment.

## Recommendations

Given these considerations, the recommendations for BCAG are as follows:

1. **Select a preferred scenario to refine in ICT Plan development and remain proactive with ZEB deployment grants:** This Master Plan was developed to present BCAG with options for transitioning to a zero-emission fleet. Following BCAG's selection of the BEB majority transition scenario, the ICT Rollout Plan has been developed for submittal to CARB in compliance with the ICT Regulation. This document will put forth BCAG's vision for a ZEB Transition and will act as a living document to help the agency plan grant funding requirements. As a greater proportion of BCAG's fleet converts to ZEB technology, auxiliary equipment, hardware, and software will be needed to ensure a successful fleet transition. BCAG should continue to remain proactive in the purchase and deployment of ZEBs and their associated systems by taking advantage of various grant and incentive programs.
2. **Apply learnings from emergency disaster response:** Evaluate the tradeoffs for various alternatives to reduce the risk from power outages and fuel disruptions, and allow BCAG to meet all first responder requirements from the 3R Assessment.

3. **Match the individual bus technology to the individual route and blocks:** BCAG should consider the strengths of given ZEB technologies and focus those technologies on routes and blocks that take advantage of their efficiencies and minimize the impact of the constraints related to the respective technologies. These technologies cannot follow a one-size-fits-all approach from either a performance or cost perspective. Matching the present technology to the present service levels will be a critical best practice.
4. **Monitor local and regional developments:** In the zero-emission technology sector, developments at the local level can have the ability to catapult the industry forward. When local bus OEMs or fuel providers enter the zero-emission market, it can spark technological innovation or cost reduction. Neighboring transit agencies can also work together through group purchasing agreements and lobbying efforts to bring about reduced purchase costs or more funding opportunities.

The transition to ZEB technologies represents a paradigm shift in bus procurement, operation, maintenance, and infrastructure. It is only through a continual process of deployment with specific goals for advancement that the industry can achieve the goal of economically sustainable, zero-emission transportation sector. Widespread adoption of zero-emission bus technology has the potential to significantly reduce greenhouse gas (GHG) emissions resulting from the transportation sector. BCAG is committed to implementing environmentally-friendly policies and reducing its carbon footprint.

The analysis contained herein was completed based on the best available fleet data and procurement schedule available as of 2021. Between the completion of the analysis and the completion of this report, the agency's procurement schedule has changed slightly to include procuring at least 6 BEBs in the near future. Although this change will create a deviation from the results shown in this document, the impact on the relative cost differentials between scenarios would be fairly negligible as all scenarios would be equally impacted and it would not cause a significant change in the cost comparison of one scenario to the next.

# Introduction

Butte County Association of Governments (BCAG), the owner and operator of Butte Regional Transit (B-Line), is in the process of converting its bus fleet to zero-emission buses (ZEB) by 2040. As a transit agency in California, BCAG is subject to the Innovative Clean Transit (ICT) regulation, requiring all California transit agencies to follow zero-emission procurement guidelines with the goal of achieving 100% zero-emission fleets by 2040. To explore BCAG's options for meeting this fleet electrification target, this transition study presents four zero-emission fleet transition scenarios and uses BCAG's current fleet operations as a baseline to measure the effects of each transition scenario. For each scenario, this study assesses bus and cutaway purchase costs, fuel costs, infrastructure investments, and maintenance costs. Additionally, this study also takes into account BCAG's local needs and conditions, namely considering resilience, redundancy, and emergency response adaptation options. By using real data provided by BCAG, its partners, and industry-reliable sources in the assessments, BCAG will be able to draw insights to choose the optimal zero-emission transition scenario.

## BCAG Background Information

### History

In June 2005, B-Line was formed in order to consolidate transit systems previously operated by the County of Butte (Butte County Transit), the City of Chico (Chico Area Transit), the City of Oroville (Oroville Area Transit) and the Town of Paradise. B-Line service is delivered by a contract transit operator, Transdev, Inc., which also performs dispatching and maintenance duties at the Butte Regional Operations Center (BROC) in the City of Chico.

BCAG is the Regional Transportation Planning Agency (RTPA) and Metropolitan Planning Organization (MPO) for Butte County, as designated by the Secretary of the Business Transportation & Housing Agency for the State of California. Through the BCAG Joint Powers Agreement, the BCAG Board also serves as the administrative and policymaking agency for B-Line allowing for better routes, a uniform fare structure, improved service with timed transfers, consistent headways for ease of use, and comprehensive customer service.[1]

1 BCAG Unmet Transit Needs Assessment – 2021/2022
http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf

## Service Area and Bus Service

B-Line provides regional and local public transit services in Butte County and covers roughly 700 square miles. The current bus fleet consists of 32 fixed-route buses: 30 diesel buses (11 35-feet diesel and 19 40-feet diesel buses) and 2 CNG buses (40-feet).[2]

B-Line operates 21 fixed routes, which includes 5 regional routes, 15 local routes, and an express route to Chico Airport. Regional routes connect the towns and cities of Chico, Oroville, Paradise, Magalia, Gridley, and Biggs. Local routes serve the Chico urban area and the city of Oroville. The regional routes average speed is 28.9 mph. For local routes, the average speed is 15 mph. The average speed for the express route is 17.3 mph.

B-Line also operates 2 types of paratransit services—ADA Paratransit and Dial-A-Ride. Their paratransit fleet consists of 22 gasoline-powered cutaway vehicles (28-feet).

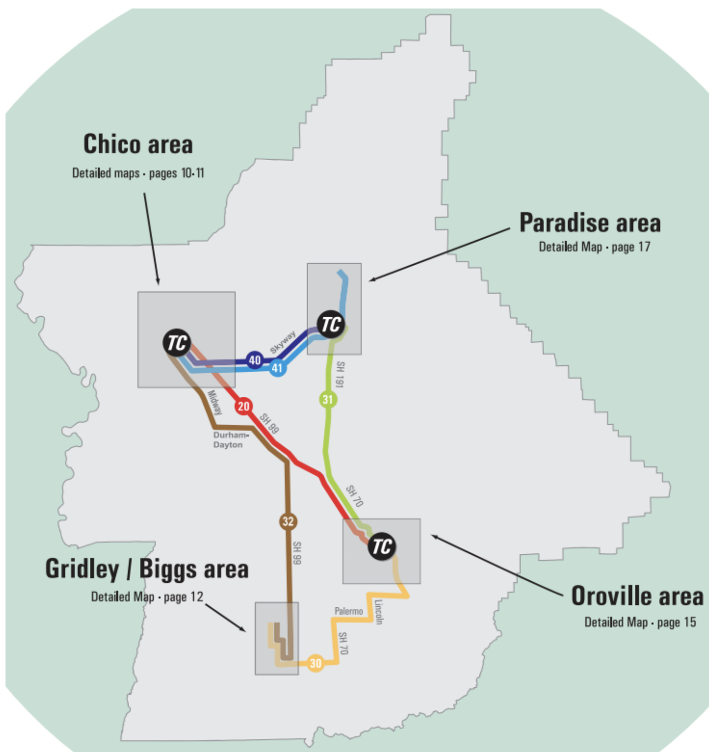


*Figure 3 - BCAG Service Area*

2 BCAG is expected to procure 2 New Flyer BEBs in 2022 and 3 more in 2024.

## Ridership

B-Line serves a diverse community, with a large portion of its daily passengers being individuals without cars (by choice or because of financial limitation), university students, and paratransit riders. Although ridership on transit in general has been decreasing over the past few years due in part to lower gas prices and more affordable automobiles, which has allowed more people the opportunity to own personal cars, the ridership reductions seen by B-Line in recent years are more directly tied to reduced population in its service area following the Camp Fire. [3] In 2018, the Camp Fire burned through Butte County and destroyed homes and businesses in the town of Paradise, which is served by B-Line. In 2020, B-Line's service was further reduced by the Coronavirus Disease 2019 SARS-CoV-2 (COVID/COVID-19) pandemic.

B-Line's service experienced significant reduction after the 2018 Camp Fire and has not returned to its original service levels and is not expected to. Since the beginning of the COVID-19 pandemic, the services have stayed the same with the exception of Route 40 and 41, which runs through areas affected by the Camp Fire—demand for bus service in Paradise has remained low. Based on BCAG's data of available ridership and total fares received from July 2018 through the month of June 2019 (pre-COVID levels), there were 949,871 fixed-route passengers and 141,277 paratransit passengers.[4] BCAG anticipates annual ridership to be less than this over the next 5 years. In response to the changing ridership needs, due in part to the Camp Fire and COVID, BCAG is conducting a Route Optimization Study, which will be completed in the Summer of 2023 in order to re-assess how to most efficiently serve individual routes as well as the whole system.

## Providing Zero-Emission Service to DACs

In California, CARB defines disadvantaged communities (DACs) as communities that are both socioeconomically disadvantaged and environmentally disadvantaged due to local air quality. Lower income neighborhoods are often exposed to greater vehicle pollution levels due to proximity to freeways and the ports, which puts these communities at greater risk of health issues associated with tailpipe emissions.[5] ZEBs will reduce energy consumption,

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[3] Grengs, Joe, Jonathan Levine, and Qingyun Shen. (2013). Evaluating transportation equity: An inter-metropolitan comparison of regional accessibility and urban form. FTA Report No. 0066. For the Federal Transit Administration

[4] Page 21 of BCAG's Unmet Transit Needs Assessment – 2021/2022 http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf

[5] Reichmuth, David. 2019. Inequitable Exposure to Air Pollution from Vehicles in California. Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019

harmful emissions, and direct carbon emissions in six opportunity zones and disadvantaged communities in rural Northern California as shown in in the service map below. B-Line serves the following census communities identified as DACs: 6007003700 and 6007001300, which have a pollution burden of 85-90% according to CalEnviroScreen. They are shown in **Figure 4** below.

Environmental impacts, both from climate change and from local pollutants, disproportionately affect transit riders. For instance, poor air quality from tailpipe emissions and extreme heat harm riders waiting for buses at roadside stops. The transition to zero-emission technology will benefit the region by reducing fine particulate pollution and improving overall air quality. In turn, the fleet transition will support better public health outcomes for residents in DACs served by the selected routes.

Public transit has the potential to improve social equity by providing mobility options to low-income residents lacking access to a personal vehicle and helping to meet their daily needs. In California, transit use is closely correlated with car-less households as they are five times more likely to use public transit than households with at least one vehicle.[6] Although 21% of Californians in a zero-vehicle household are vehicle free by choice, 79% do not have a vehicle due to financial limitations. Many low-income people therefore rely solely on public transportation for their mobility needs.[7] B-Line's current fleet of fixed route diesel buses consumes an annual average of 247 thousand gallons of diesel. The combustion of this fuel exposes those who are reliant on public transportation to diesel exhaust, which has been classified as a probable human carcinogen with links to asthma and other lung related health issues.[8] Portions of B-Line's service area are in the 90th-100th percentile for diesel particulate matter (PM) according to CalEnviroScreen 4.0. Moving B-Line's fleet to zero-emission technology will help alleviate this pollution, which will improve the health of communities impacted by high diesel PM and all Sacramento Valley communities.

6 Grengs, Joe, Jonathan Levine, and Qingyun Shen. (2013). Evaluating transportation equity: An inter-metropolitan comparison of regional accessibility and urban form. FTA Report No. 0066. For the Federal Transit Administration

7 Paul, J & Taylor, BD. 2021. Who Lives in Transit Friendly Neighborhoods? An Analysis of California Neighborhoods Over Time. Transportation Research Interdisciplinary Perspectives. 10 (2001) 100341. https://reader.elsevier.com/reader/sd/pii/S2590198221000488?token=CABB49E7FF438A88A19D1137A2B1851806514EF576E9A2D9462D3FAF1F6283574907562519709F8AD53DEC3CF95ACF27&originRegion=us-east-1&originCreation=20220216190930

8 National Resources Defense Council Coalition for Clean Air. No breathing in the aisles — diesel exhaust inside school buses. New York: The Council; January 2001.
Available: www.nrdc.org/air/transportation/schoolbus/sbusinx.asp

Access to quality transit services provides residents with a means of transportation to go to work, to attend school, to access health care services, and run errands. By purchasing new vehicles and decreasing the overall age of its fleet, B-Line is also able to improve service reliability and therefore maintain capacity to serve low-income and disadvantaged populations. Replacing diesel vehicles with zero-emission vehicles, will also benefit these populations by improving local air quality and reducing exposure to harmful emissions from diesel exhaust.

### Emissions Reductions for DACs

Greenhouse gases (GHG) are the compounds primarily responsible for atmospheric warming and include carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$). The effects of greenhouse gases are not localized to the immediate area where the emissions are produced. Regardless of their point of origin, greenhouse gases contribute to overall global warming and climate change.

Criteria pollutants include carbon monoxide (CO), nitrogen oxides (NOx), particulate matter under 10 and 2.5 microns ($PM_{10}$ and $PM_{2.5}$), volatile organic compounds (VOC), and sulfur oxides ($SO_X$). These pollutants are considered harmful to human health because they are linked to cardiovascular issues, respiratory complications, or other adverse health effects.[9] These compounds are also commonly responsible for acid rain and smog. Criteria pollutants cause economic, environmental, and health effects locally where they are emitted. CARB defines DACs in part as disadvantaged by poor air quality because polluting industries or freight routes have often been cited in these communities. The resulting decrease in air quality has led to poorer health and quality of life outcomes for residents.

By transitioning to ZEBs from diesel buses, B-Line's zero-emission fleet will produce fewer carbon emissions and fewer harmful pollutants from the vehicle tailpipes. Communities disadvantaged by pollution served by B-Line's fleet will therefore directly benefit from the reduced tailpipe emissions of ZEBs compared to ICE buses.

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9 Institute of Medicine. Toward Environmental Justice: Research, Education, and Health Policy Needs. Washington, DC: National Academy Press, 1999; O'Neill MS, et al. Health, wealth, and air pollution: Advancing theory and methods. Environ Health Perspect. 2003; 111: 1861-1870; Finkelstein et al. Relation between income, air pollution and mortality: A cohort study. CMAJ. 2003; 169: 397-402; Zeka A, Zanobetti A, Schwartz J. Short term effects of particulate matter on cause specific mortality: effects of lags and modification by city characteristics. Occup Environ Med. 2006; 62: 718-725.

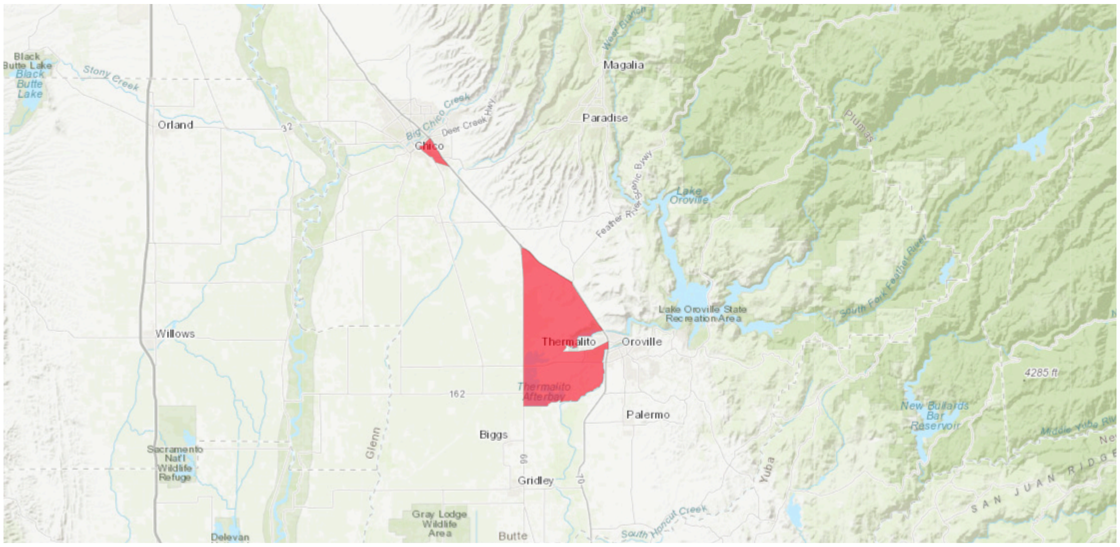


*Figure 4 - B-Line Disadvantaged Communities Service Map*

## About BCAG

**Transit Agency's Name:** Butte Regional Transit

**Mailing Address:** 326 Huss Dr. Suite 150, Chico, CA 95928

**Transit Agency's Air Districts:** California's 35 local Air Districts are responsible for regional air quality planning, monitoring, and stationary source and facility permitting. The districts administer air quality improvement grant programs and are CARB's primary partners in efforts to ensure that all Californians breathe clean air.[10] BCAG is part of the Butte County Air Quality Management District.

**Transit Agency's Air Basin:** Butte County Air Quality Management District is part of Sacramento Valley Air Basin District.[11]

**Total number of buses in Annual Maximum Service:** The maximum number of active buses operating fixed-route service out of the Butte Regional Operations Center is 32. B-Line also operates 22 gas cutaway vehicles in support of dial-a ride and paratransit service.

**Urbanized Area:** Chico, CA. Chico is 28 square miles of land area with 2,161 people per square mile living within that area. Chico is the metropolitan center of the county. The current population of the Chico Urbanized Area is approximately 101,475 and the population of Butte County is approximately 211,632. Before the Camp Fire, the Chico Urbanized Area had a population of approximately 104,538 residents and the total population of Butte County was approximately 223,877.

**Population of Urbanized Area:** 101,475

Approximately 211,632 people live in Butte County, California. Butte's southern border is located about 50 miles north of Sacramento. The total area of the county is 1,665 square miles. Most of this land area is sparsely populated, at an average of 124 people per square mile. There are four main population centers located around the county. These are the cities of Oroville and Gridley/ Biggs in the south and Chico and Paradise in the north. The city of Chico is home to 101,475 residents. This number represents nearly half of the county's entire population. The greater Oroville area is home to about 20,042 people and the town of Paradise is home to about 27,000 people. There are approximately 7,421 persons living in Gridley and 1,799 living in neighboring Biggs. The remainder of Butte's population is spread out around other rural areas. Chico is the only population cluster in Butte County that falls under the U.S. Census classification of urban. Oroville, Paradise,

[10] https://ww2.arb.ca.gov/california-air-districts

[11] https://www.airquality.org/Meetings/Sacramento-Valley-Basinwide-Air-Pollution-Control-Council

Gridley, Biggs, and other unincorporated county areas are all classified as rural (April 1, 2020 U.S. Census Bureau).

**Contact information Deputy Director:**

Andy Newsum, Deputy Director, Butte County Association of Governments
326 Huss Drive, Suite 150
Chico, CA 95928
Tel: (530) 809-4616
ANewsum@bcag.org

**Is your transit agency part of a Joint Group?** No

## Fleet Facility

BCAG/B-Line currently has one maintenance facility, located at 326 Huss Ln, Chico, CA 95928 as shown in **Figure 5.**

*Figure 5 - Butte Regional Operations Center*

## California Air Resources Board Innovative Clean Transit Regulation

On December 14, 2018, California Air Resources Board (CARB) enacted the Innovative Clean Transit (ICT) regulation, requiring all California public transit agencies to create a plan to achieve a 100% zero-emission fleet by 2040. In April 2021, BCAG entered into contract with the Center for Transportation and the Environment (CTE) to conduct a full fleet ZEB Transition Plan in accordance with the California Air Resources Board's (CARB) Innovative Clean Transit (ICT) program. The project includes operational and technical analysis to support BCAG through the creation of a zero-emission transition plan.

The zero-emission technologies considered in this study are battery-electric buses (BEB) and hydrogen fuel cell electric buses (FCEBs). BEBs and FCEBs have similar electric drive systems that feature a traction motor powered by a battery. The primary differences between BEBs and FCEBs are the respective amount of battery storage and the method by which the batteries are recharged. The energy supply in a BEB comes from electricity provided by an external source, typically the local utility's electric grid, which is used to recharge the batteries. The energy supply for an FCEB is completely on-board, where gaseous hydrogen, stored in tanks, is converted to electricity within a fuel cell. The electricity from the fuel cell is used to recharge the batteries.

## ZEB Purchase Requirements

CARB's ICT regulation requires all transit agencies to purchase only ZEBs from 2029 onward. Partial ZEB purchasing requirements begin in 2023 for large agencies and in 2026 for small agencies with the goal of transitioning all agencies to a 100% ZEB fleet by 2040.

CARB designates B-Line's fleet as a small fleet because the transit agency operates less than 100 vehicles at peak pullout. For small agencies, the ICT regulation requires that all new bus purchases include a specified percentage of ZEBs in accordance with the following schedule in **Table 3.**

*Table 3 - CARB ICT ZEB Transition Timeline for Small Agencies*

| Starting January 1 | Percent of New Bus Purchases |
|---|---|
| 2026 | 25% |
| 2027 | 25% |
| 2028 | 25% |
| 2029 | 100% |

Agencies can defer the purchase of a cutaway bus, over-the-road bus, double-decker bus, or articulated bus until either January 1, 2026 or until a model of a given type has passed the Altoona bus testing procedure and obtained a Bus Testing Report, regardless of purchasing milestones. At the time of writing this report, a cutaway vehicle has passed Altoona testing (GreenPower's EV Star) but CARB has not revised its regulation regarding cutaway buses, noting that the vehicle that has passed is too small to meet the requirements of many cutaway vehicles.

Agencies may request exemptions from ZEB purchase requirements in a given year due to circumstances beyond the transit agency's control. Acceptable circumstances include:

- Delay in bus delivery caused by setback of construction schedule of infrastructure needed for the ZEB;
- Market-available depot-charged BEBs cannot meet a transit agency's daily mileage needs;
- Market-available ZEBs do not have adequate gradeability performance (i.e., unable to climb a slope at efficient speed) to meet the transit agency's daily needs;
- When a required ZEB type for the applicable weight class based on gross vehicle weight rating (GVWR) is unavailable for purchase because the ZEB has not passed the Altoona bus test; cannot meet ADA requirements; or would violate any federal, state, or local regulations or ordinances;
- When a required ZEB type cannot be purchased by a transit agency due to financial hardship.

## BCAG's ZEB Credits

ZEBs that are purchased ahead of mandated deadlines can be submitted to CARB when the deadlines come into effect. The agency is able to submit any combination of new ZEBs and ZEBs already in the fleet in order to meet the required purchase percentage. All buses already in the fleet can only be used once to offset one single bus purchase. BCAG plans to procure up to eight BEBs that will enter into service beginning in 2023. BCAG plans to submit two of these buses that will already be in the fleet prior to 2026 to offset the 25% ZEB purchase requirement in 2027.

## ZEB Rollout Plan

BCAG is required to submit a ZEB Rollout Plan to CARB that has been approved by their governing body by July 1, 2023. Per CARB regulations, Rollout Plans must include all of the following components:

- A goal of full transition to ZEBs by 2040 with careful planning that avoids early retirement of conventional internal combustion engine (ICE) buses;
- Identification of the types of ZEB technologies a transit agency is planning to deploy, such as battery-electric or fuel cell electric buses;
- A schedule for construction of facilities, infrastructure modifications, or upgrades including charging, fueling, and maintenance facilities to deploy and maintain ZEBs. This schedule must specify the general location of each facility, type of infrastructure, service capacity of an infrastructure, and a timeline for construction;
- A schedule for zero-emission and conventional ICE bus purchases and lease options. This schedule for bus purchase replacements must identify the bus types, fuel types, and number of buses;
- A schedule for conversion of conventional ICE buses to ZEBs, if any. This schedule for bus conversion must identify number of buses, bus types, the propulsion systems being removed and converted to;
- A description on how a transit agency plans to deploy ZEBs in disadvantaged communities as listed in the latest version of CalEnviroScreen at the time the Rollout Plan is submitted;
- A training plan and schedule for ZEB operators and maintenance and repair staff;
- The identification of potential funding sources.

Findings outlined in this Master Plan are intended to inform BCAG in selecting a scenario to put forward in the ICT Rollout Plan that will be submitted to CARB.

## Reporting Requirements

Starting March 31, 2021, and continuing every year thereafter through March 31, 2050, each transit agency must submit an annual ICT ZEB compliance report by March 31 for the prior calendar year. The initial report was to have been submitted by March 31, 2021 and must have included the number and information of active buses in the transit agency's fleet as of December 31, 2018.

## Assessment Scenarios

For this study, CTE developed 4 scenarios to compare to a baseline scenario and analyze the feasibility and cost effectiveness of implementing each bus technology as well as co-implementation of both technologies. The scenarios are referred to by the following titles and described, in detail, below. A baseline scenario was developed to represent the typical "business-as-usual" case with retention of ICE buses for cost comparison purposes.

0. Baseline (current technology)
1. BEB Only

2a. Mixed Fleet - BEB Majority
2b. Mixed Fleet - FCEB Majority
3. FCEB Only

In the **BEB WITH DEPOT-ONLY CHARGING** scenario, BEBs are purchased and deployed only on blocks that are within a BEB's achievable range as determined by CTE's modeling. If depot-charged BEBs are not capable of meeting a transit agency's daily service requirements, there is an exception in the ICT regulation that will allow the agency to request an exemption to retain ICE buses in their fleet. Based on CTE's modeling, all of B-Line's blocks are fully achievable using BEB technology by 2035.

In the **MIXED FLEET – BEB MAJORITY – (75% BEB) SCENARIO**, FCEBs supplement a primarily BEB fleet to make up a fully ZEB fleet. The costs for infrastructure and installation of two different charging and fueling infrastructures are taken into account. FCEBs and hydrogen fuel, however, are more expensive than BEBs and electricity, so this scenario allows BCAG to assign the less expensive BEB technology where possible and supplement service with FCEBs as needed in support of resilience and redundancy adaption measures.

A **MIXED FLEET – FCEB MAJORITY (75% FCEB) SCENARIO** BEBs supplement a primarily FCEB fleet to make up a fully ZEB fleet. The costs for infrastructure and installation of two different charging and fueling infrastructures are taken into account. Based on CTE's modeling, all of B-Line's blocks are fully achievable using BEB technology by 2035, however, the range of FCEBs already currently exceed that of BEBs. This assessment therefore considers FCEBs capable of replacing diesel buses at a 1:1 ratio and allows B-Line the flexibility to operate the FCEBs in any of its blocks. In turn, blocking assignments are a key consideration for BEBs, particularly for those that are purchased prior to 2035. Overall, a mixed fleet is more resilient as it would allow service to continue if either fuel became temporarily unavailable for any reason.

Finally, the **FCEB ONLY SCENARIO** was developed to examine the costs for hydrogen fueling and transitioning to a 100% FCEB fleet. A fully FCEB fleet avoids the need to install two types of fueling infrastructure by eliminating the need for depot charging equipment. Fleets comprised entirely of fuel cell electric buses also offer the benefit of scalability compared to battery electric technologies. Adding FCEBs to a fleet does not necessitate large complementary infrastructure upgrades. Despite this benefit, the cost of FCEBs and hydrogen fuel are still more expensive than BEBs and electricity at current market prices.

When considering the various scenarios, this study can be used to develop an understanding of the range of costs that may be expected for BCAG's ZEB transition, but ultimately, can only provide an estimate. Furthermore, this study aims to provide an overview of the myriad considerations the agency must take into account in selecting a transition scenario that go beyond cost, such as space requirements, safety implications, and operational changes that may differ between scenarios.

## Terms and Definitions

- "Fuel" and "energy" are used interchangeably in this report, as ZEB technologies do not always require traditional liquid fuel. In the case of BEBs, "fuel" is electricity and costs include energy, demand, and other utility charges.
- The transition period is defined as achieving 100% ZEB fleet purchasing by 2040 to comply with the CARB ICT regulation.

## Assessment Assumptions

This transition study uses multiple assumptions to model B-Line's long-term fleet transition. The overarching assumptions are:

- Heavy-duty large buses have a normal service life of 12 years.[12]
  - This assumption follows the Federal Transit Administration's (FTA's) definition of vehicle useful life of 12 years as its retirement policy for their standard bus sizes.
- BEBs are modeled to have a battery capacity of 440 kWh (35' & 40'). FCEBs have fuel tank capacity of 40kg (35' & 40').
  - These figures are based on the average of the bus manufacturers' specifications for the model compared with the Altoona Bus Testing and Research Center's bus report at the time of analysis.[13]
- Electric cutaways are modeled to have a battery capacity of 110 kWh. Since a commercially available fuel cell electric cutaway is not yet available, it was assumed that the capacity would be specified in BCAG's RFP to be 13kg.
- A 5% improvement in battery capacity occurs every two years, with a cap at 733 kWh.
  - For this study, considering the extended period of a complete fleet transition through 2040, CTE assumes a conservative 5% improvement of battery capacity every two years[14]. If the trend continues, buses will continue to

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[12] Federal Transit Administration, "Useful Life of Transit Buses and Vans". U.S. Department of Transportation. Retrieved on May 5, 2021, from https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Useful_Life_of_Buses_Final_Report_4-26-07_rv1.pdf

[13] Altoona Bus Research and Testing Center, Bus Tests. Penn State College of Engineering. Retrieved on May 5, 2021, from https://www.altoonabustest.psu.edu/bus-tests/index.aspx

[14] BloombergNEF, "Hitting the EV Inflection Point". Bloomberg Finance L.P.2021. Retrieved on December 5, 2021, from https://www.transportenvironment.org/wp-content/uploads/2021/08/2021_05_05_Electric_vehicle_price_parity_and_adoption_in_Europe_Final.pdf

increase the amount of energy they carry on-board without added onboard battery storage or reduction in passenger capacity.

  - CTE calculated a reasonable cap on the maximum battery capacity range based on the current (2021) top of the market nameplate capacity of 686 kWh, current battery capacity improvement rates, and physical limitations of bus designs. This cap was calculated at 733 kWh and is expected to be reached by 2032.

- A 5% improvement in hydrogen tank size occurs every two years.
  - This serves as a proxy for other component improvements such as battery capacity, motor efficiency, and fuel cell efficiency.
- FCEBs can more readily replace ICE buses one-for-one.
  - Alameda-Contra Costa Transit District (AC Transit) and OCTA have reported operational ranges for FCEBs up to 350 miles.

## ZEB Transition Planning Methodology

This study uses CTE's ZEB Transition Planning Methodology. The methodology encompasses nine key phases; these stages are sequential and build upon findings in previous steps. The phases specific to this study are outlined below:

0. Planning & Initiation
1. Requirements & Data Collection
2. Service Assessment
3. Fleet Assessment
4. Fuel Assessment
5. Facilities Assessment
6. Maintenance Assessment
7. Total Cost of Ownership Assessment
8. ZEB Transition Plan – Document Creation

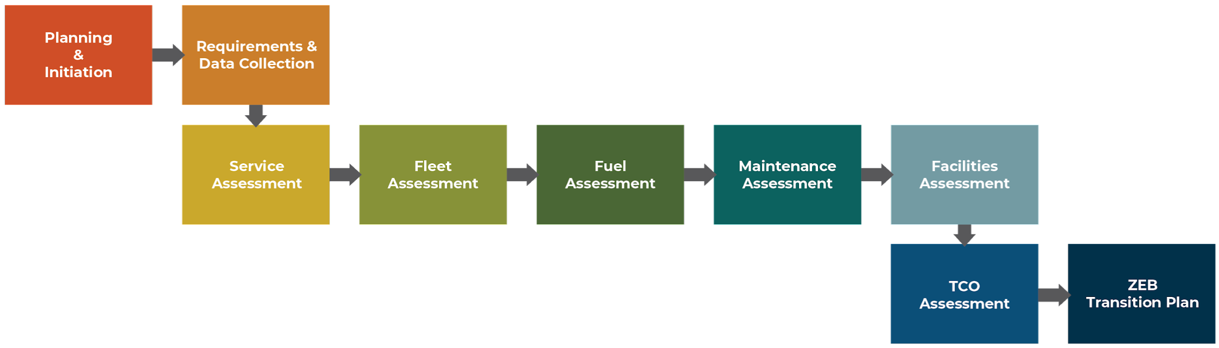



*Figure 6: CTE's ZEB Transition Study Methodology*

The **PLANNING & INITIATION** phase builds the administrative framework for the transition study. During this phase, the project team drafts the scope, approach, tasks, assignments and timeline for the project. CTE worked with BCAG staff to plan the overall project scope and all deliverables throughout the full life of the study.

For the **REQUIREMENTS & DATA COLLECTION**, CTE collects GPS data on selected routes and utilizes software models to estimate ZEB performance. The results from this modeling are used to estimate feasibility of every block in B-Line's network using BEBs and FCEBs.

The **SERVICE ASSESSMENT** phase initiates the technical analysis of the study. The results from the Service Assessment are used to guide ZEB procurements in the Fleet Assessment and to determine energy requirements (depot charging and/or hydrogen) in the Fuel Assessment. CTE met with BCAG to define assumptions and requirements used throughout the study and to collect operational data. This process was conducted for both the fixed service blocks and the paratransit cutaway fleet. Since the paratransit fleet was also expending a significant amount of energy idling, CTE also conducted an Endurance Analysis, which brought the energy requirements of the HVAC while idling into consideration for determining the range of these vehicles. The results found that idling would have a significant detrimental impact on cutaway range. BCAG elected not to pursue electric cutaways further in the analysis, but were interested in seeing fuel cell cutaways being introduced to makeup 20% of the cutaway fleet in 2030 in the Fleet Assessment.

The **FLEET ASSESSMENT** develops a projected timeline for replacement of ICE buses with ZEBs that is consistent with the agency's fleet replacement plan based on results from the Service Assessment. Since B-Line's blocking was determined to be achievable with BEBs, the mixed fleet scenarios were defined based on composition percentages that would allow for BCAG to explore the impacts of a majority FCEB, majority BEB fleet, and an all FCEB fleet on bus capital, fuel and infrastructure costs. This analysis included an outline of the expected fleet structure and capital costs expected over the transition period for all scenarios explored and how they can be best optimized with regard to any state mandates, such as CARB's ICT regulation, or to meet agency goals, such as minimizing cost or maximizing service levels.

The **Fuel Assessment** merges the results of the Service Assessment and Fleet Assessment to determine annual fuel requirements and associated costs. The Fuel Assessment calculates energy costs throughout the entire transition timeline for each scenario, including the agency's current ICE buses. As current technologies are phased out in later years of the transition, the Fuel Assessment calculates the increasing energy requirements for ZEBs. The Fuel Assessment also provides a total energy cost over the transition lifetime.

The **Facilities Assessment** determines the necessary infrastructure to support the projected zero-emission fleet based on results from the Fleet Assessment and Fuel Assessment. The Facilities Assessment is calculated for each scenario used in the Fleet and Fuel Assessments. The assessment determines the required hydrogen and battery-electric infrastructure and calculates associated costs.

The **Redundancy, Resilience, and Emergency Response (3R) Assessment** investigates the new risks to an agency's ability to provide service during power outages or fuel disruptions, and to support required emergency response activities, such as community evacuation with a full ZEB fleet. The outcomes of the 3R assessment are a summary of the risk reduction capabilities and cost effectiveness of recommendation of alternatives to mitigate the impacts from identified risks specific to an agency's risk tolerances, facility constraints, and budget.

The **Maintenance Assessment** calculates all projected fleet maintenance costs over the life of the project. These costs include those related to existing ICE buses remaining in the fleet, as well as new cutaways, BEBs and FCEBs, calculated for each scenario.

The **Total Cost of Ownership Assessment** compiles results from the previous assessments and provides a comprehensive view of all associated costs, organized by scenario, over the transition lifetime.

# Requirements Analysis

## Baseline Data Collection

Understanding the key elements of B-Line's service is essential to evaluating the costs of a complete transition to a zero-emission fleet. BCAG staff provided key data on current B-Line service including:

- Current fleet composition including vehicle propulsion types and lengths
- Route and block information including distances and trip frequency
- Mileage and fuel consumption
- Maintenance costs

CTE prepared the templates for BCAG's ZEB Transition data collection and the BCAG Agency Data Collection Template was prepared and distributed to the agency to begin the **Requirements Analysis & Data Collection** stage of the project. As part of this effort, CTE travelled to Chico to ride identified sample routes and collect GPS data. CTE and BCAG also decided that because paratransit service makes up a large percentage of BCAG's service, CTE should include these cutaways as part of the modeling for the ZEB Transition Plan assessment, although it was not required by the ICT regulation since there is not currently an Altoona tested zero-emission paratransit vehicle that can operate this service. For this purpose, GPS data was also collected for a full day of paratransit service. CTE also met internally to discuss the best approach for conducting the analysis of these service vehicles for the purposes of ZEV transition planning.

## Fleet Composition

In May 2021, the B-Line bus fleet included 2 CNG buses and 30 diesel buses used for fixed route service, and 22 gasoline powered cutaways used for paratransit service. A summary of the 2022 fleet by vehicle size, fuel type, and bus length is shown in **Table 4**. Bus services operate out of one depot in Chico, CA. Operations, maintenance, and fueling functions are performed at the depot. B-Line's current service consists of 21 fixed routes run on 57 blocks.

*Table 4 - Fleet Summary by Depot, Length, and Fuel Type*

| Depot | Bus Length | Fuel Type | | | |
|---|---|---|---|---|---|
| | | CNG | Diesel | Gasoline | Total |
| | Cutaway (28') | | | 22 | 22 |
| Huss Drive | 35' | | 11 | | 11 |
| | 40' | 2 | 19 | | 21 |
| | Total | 2 | 30 | 22 | 54 |

## Planned Procurement

In planning B-Line's replacement schedule, CTE documented and integrated BCAG's in-progress procurements. BCAG has already been awarded and allotted funding for up to 8 BEBs that will be in service by the end of 2024. However, at the time of this report, only five BEBs were expected. These five, as well as the additional procurement are outlined in **Table 5** below.

*Table 5 - Known Procurements*

| Purchase Year | First Service Year | Fuel Type | Number of Buses | Series Being Replaced |
|---|---|---|---|---|
| **2022** | 2023 | BEB | 6 | 081,082, 1101, 1103-1106 |

## Miles and Fuel Consumption

Data on B-Line's current fuel use is used to estimate energy costs throughout the transition period. This study assumes no cost escalation for fuel throughout the transition period. Average annual fleet mileage and fuel use are shown in **Table 6** and **Table 7.**

*Table 6 - Average Annual Service Miles by Bus Length*

| Average Annual Miles per Bus | | | | |
|---|---|---|---|---|
| **Fuel Type / Length** | **CNG** | **Diesel** | **Gasoline** | **Total Average** |
| **Cutaway 28'** | | | 20,368 | 20,368 |
| **35'** | | 39,617 | | 39,617 |
| **40'** | 40,509 | 49,316 | | 48,477 |

*Table 7 - Total Average Annual Diesel Consumption by Bus Length*

| Bus Length | Total Average of Annual Fuel Use (Diesel Gallon Equivalent DGE) |
|---|---|
| **Cutaway 28'** | 80,190 |
| **Diesel 35'** | 92,979 |
| **Diesel 40'** | 154,137 |
| **CNG 40'** | 9,826 |
| **Total Average** | 67,427 |

# Service Assessment

The **SERVICE ASSESSMENT** analyzes the feasibility of maintaining B-Line's current level of service with BEB and FCEB buses. The key component of the Service Assessment is the Block Analysis, which analyzes bus range limitations to determine if ZEBs can meet the service requirements of the blocks within the transition period. The energy needed to complete a block is compared to the available energy for the prospective bus type that is planned for the block. If the prospective bus's available energy exceeds the block's required energy, then that block is considered feasible for that ZEB type. The Service Assessment also yields a timeline for when blocks become achievable for zero-emission buses as technology improves. This information is used to then inform ZEB procurements in the Fleet Assessment.

Bus efficiency and range are primarily driven by bus specifications; however, both metrics can be impacted by a number of variables including the route profile (i.e., distance, dwell time, acceleration, sustained top speed over distance, average speed, traffic conditions, deadhead), topography (i.e., grades), climate (i.e., temperature), driver behavior, and operational conditions (i.e., passenger loads and auxiliary loads). As such, the efficiency and range of a given ZEB model can vary dramatically from one agency to another. Therefore, it is critical to determine efficiency and range estimates that are based on an accurate representation of B-Line's operating conditions.

The first task in the Service Assessment is to develop route and bus models to run operating simulations for typical B-Line routes. In order to accomplish this, the efficiency values that were obtained through modeling based on the collected GPS data of B-Line's routes were used to determine the amount of energy required for each of B-Line's blocks. The Service Assessment determines the percentage of the agency's blocks that will be achievable in a given year considering the energy demand of the blocks and the battery capacity of the buses (for 35' and 40') with an assumed battery capacity improvement factor of 5% every year. This improvement in battery capacity increases the estimated range of the buses over time, which gradually increases the percentage of blocks that are achievable by 2040. This process was conducted for both the fixed service blocks and the paratransit cutaway fleet.

CTE obtained this data for routes 3, 5, 16, 20, 30, and 41. A full day of B-Line's paratransit service was also sampled. CTE uses a sampling approach for gathering data on an agency's service in which representative sample routes are identified based on topography and average speed characteristics. CTE collected GPS data—which includes time, distance, bus speed, bus acceleration, GPS coordinates, and roadway grade—from 6 B-Line routes that were identified with the sampling approach, which are included in **Table 8** below.

CTE modeled B-Line's route and the vehicle energy demand to predict to predict which of B-Line's blocks can feasibly be transitioned to ZEB technology and when. By 2035, CTE's modeling predicts that a market representative BEB will be able to complete 100% of the B-Line blocks under strenuous driving conditions.

*Table 8 - Selected Routes for Modeling*

| Route ID | Route Description | Route Mileage (Round Trip - miles) | Route Category (Speed, Topography) |
|---|---|---|---|
| **3** | Nord/East | 10.88 | Flat, Low Speed |
| **5** | East 8th | 14.1 | Flat, Low Speed |
| **16** | Esplanade/SR99 | 13.54 | Flat, Low Speed |
| **20** | Chico - Oroville | 52.26 | Flat, High Speed |
| **30** | Oroville – Biggs | 51.41 | Flat, High Speed |
| **41** | Magalia - Chico | 51.25 | Hills, Low Speed |

CTE used component-level specifications for a generic electric bus and B-Line sample route data to develop a baseline performance model by simulating the operation of an electric bus on each route in Autonomie. Autonomie is a powertrain simulation software program developed by Argonne National Labs for the heavy-duty trucking and automotive industry. CTE has modified software parameters in Autonomie to assess energy efficiencies, energy consumption, and range projections for ZEBs. The energy requirements of the sample routes were then applied to all routes and blocks that share the same characteristics as the sampled routes.

The **ROUTE MODELING** analyzes varying passenger loads, accessory loads, and battery degradation to estimate real-world bus performance, fuel efficiency, and range. The GPS data from routes and the specifications for each of the bus models are used to simulate operation on each type of route. The models were run under nominal and strenuous load conditions.

**NOMINAL LOAD** conditions assume average passenger loading and a moderate temperature over the course of the day, which places marginal demands on the motor and the heating, ventilation, and air conditioning (HVAC) system. **STRENUOUS LOAD** conditions assume high or maximum passenger loading and near-maximum output of the HVAC system. These strenuous loading conditions represent a hypothetical and unlikely worst-case scenario, but one that is necessary to establish an outer bound for the analysis. This nominal/strenuous approach offers a range of operating efficiencies—measured in kilowatt-hour/mile (kWh/mi)—to use for estimating average annual energy use (nominal) or planning maximum service demands (strenuous) shown in **Table 9** below. The projected nominal and strenuous efficiencies were then used to predict if the ZEB technology will be able to complete all blocks under various battery capacity assumptions and in subsequent assessments.

*Table 9 - Modeling Results Summary*

| Route/Bus Length | Nominal Efficiency (kwh/mi) | Strenuous Efficiency (kWh/mi) |
|---|---|---|
| **2** | 1.9 | 2.5 |
| **3** | 1.9 | 2.5 |
| **4** | 1.9 | 2.5 |
| **5** | 1.7 | 2.2 |
| **7** | 1.9 | 2.5 |
| **8** | 1.9 | 2.5 |
| **9** | 1.9 | 2.5 |
| **14** | 1.9 | 2.5 |
| **15** | 1.9 | 2.5 |
| **16** | 2.0 | 2.8 |
| **17** | 1.9 | 2.5 |
| **20** | 2.4 | 2.7 |
| **24** | 1.9 | 2.5 |
| **25** | 1.9 | 2.5 |
| **26** | 1.9 | 2.5 |
| **27** | 1.9 | 2.5 |
| **30** | 1.7 | 2.0 |
| **32** | 2.0 | 2.4 |
| **40** | 1.8 | 2.2 |
| **41** | 1.8 | 2.2 |
| **52** | 1.9 | 2.5 |

## Cutaway Modeling

CTE's modeling also included an analysis for battery electric cutaway vehicles using B-Line's paratransit drive cycles. CTE found that the power limitations of the battery electric cutaway motor may only be able to meet 8 to 9% of B-Line's paratransit annual service. By 2025, 16.4% of B-Line's paratransit annual service would be considered feasible and by

2030, an electric cutaway vehicle is projected to be able to complete about half of their annual service.

Since the paratransit fleet also expends significant amount of energy idling, CTE conducted an Endurance Analysis, which brought the energy requirements of the HVAC while idling into consideration for determining the range of these vehicles. Endurance may be more representative of the paratransit duty cycle as it accounts for idling energy during breaks, loading, or pauses in service along with miles traveled. Taking into account endurance, by 2025, only 4.4% of B-Line's paratransit annual service would be considered feasible. The results found that idling would have a significant detrimental impact on cutaway range.

Based on these results, BCAG opted to refrain from applying a full zero-emission transition plan to their paratransit cutaway fleet in this current scope. BCAG, however, requested CTE to introduce fuel cell electric cutaways in future procurement cycles with the goal of transitioning up to 20% of their paratransit fleet composition from gasoline to fuel cell starting in 2030. BCAG may need to submit a request for exemption from the zero-emission bus purchase requirements in section 2023.1(c).

The **BLOCK ANALYSIS**, using the assumed 5% improvement in battery capacity or hydrogen storage capacity every two years, determines the timeline for when routes and blocks become achievable for BEBs and FCEBs. This information is used to inform ZEB procurement projections in the Fleet Assessment. Overall, the block analysis helps to determine when, or if, a full transition to ZEBs may be feasible and when there are requirements for supplemental energy solutions. Results from this analysis are also used to determine the specific energy requirements and develop the estimated costs to operate the ZEBs in the Fuel Assessment. Results from the block analysis for BEBs are included **Figure 7** below.

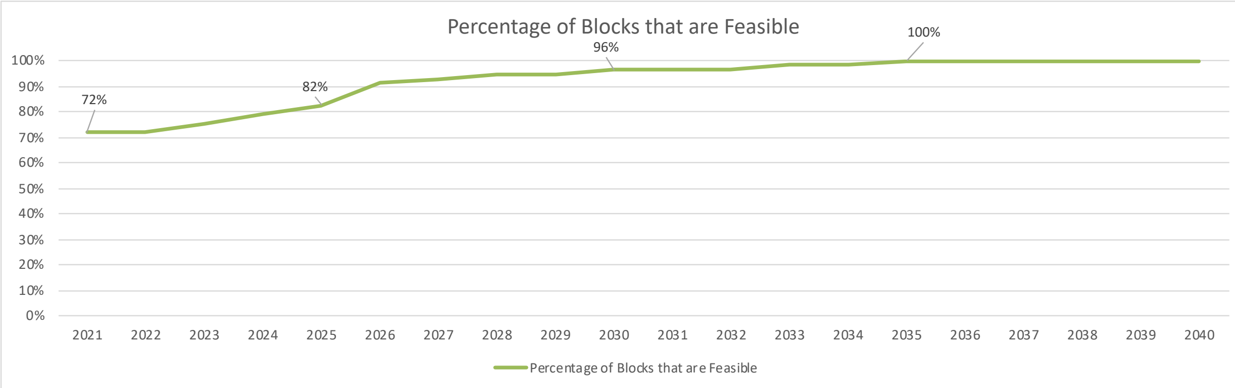



*Figure 7: BEB Block Feasibility Percentage by Year*

The BEB feasibility shows that, by 2035, 100% of B-Line's blocks can be completed under normal driving conditions when operating with a 450-kWh usable battery capacity with 5% improvement every two years capped at 733 kWh for 35-foot and 40-foot BEBs. As covered in the **Introduction** of this report, this analysis assumes the following:

- FCEBs can complete any block under 350 total miles and therefore all blocks are achievable with FCEBs throughout the transition period.
- B-Line will maintain service to similar destinations within the region and therefore the blocks maintain a similar distribution of distance, relative speeds, and elevation changes throughout the transition period. This core assumption affects energy use estimates and block feasibility in each year.

Another factor affecting block feasibility is battery degradation. BEB range is negatively impacted by battery degradation over time. A BEB placed in service on a given block with beginning-of-life batteries may not be able to complete the entire block at some point during its life before the batteries reach end-of-life. End-of-life is typically defined as when batteries reach 80% of available service energy. Conceptually, older buses can be moved to shorter, less demanding blocks and newer buses can be assigned to longer, more demanding blocks. B-Line can rotate the fleet to meet service energy demand, assuming there is a steady procurement of BEBs to match service requirements.

## Considerations for Block Analysis

With a 660kWh battery (the largest on the market), only three blocks are not feasible (95% feasibility). A zero-emission fleet could be achieved sooner with other ZEB technology solutions. However, the assumption of 5% battery capacity improvement per year may not prove out in market as forecasted. Additionally, hydrogen fuel may become more accessible in cost and distribution.

# Fleet Assessment

The goal of the FLEET ASSESSMENT is to determine what type of ZEB technology solutions are required to transition an entire fleet to zero-emission vehicles. Results from the Service Assessment are integrated with B-Line's current fleet replacement plan and purchase schedule to produce two main outputs: 1) a projected bus replacement timeline through the end of the transition period and 2) the total capital costs of those replacements. Throughout the assessment, the projected bus procurement plan is referred to. It is important to note that this is referencing the projected bus procurement at the time that CTE's assessment began in May of 2021, which only included two BEBs that would be in service by 2023, rather than the updated procurement plan that includes 6 to 8.

For this effort, the Service Assessment was used to inform the percentage of buses that could be transitioned to BEBs in a given year during the transition. Since B-Line's blocking was determined to be achievable with BEBs, the mixed fleet scenarios were defined based on composition percentages that would allow for BCAG to explore the impacts of a majority FCEB and a majority BEB fleet on bus capital, fuel and infrastructure costs. An all FCEB fleet will also be explored. This analysis included an outline of the expected fleet structure and capital costs expected over the transition period for all of the scenarios explored.

## Cost Assumptions

CTE and BCAG developed cost assumptions for each bus length and technology type (e.g., CNG, gasoline, BEB, FCEB). Key assumptions for bus costs for the BCAG ZEB Transition Plan Study are as follows:

- The base price for the gasoline-powered cutaway, CNG bus, and diesel bus are based on BCAG's reported purchase price of existing fleet inclusive of options and taxes.
- The base price for the Battery Electric 35'/40' and Fuel Cell Electric 35'/40' are from the 2019 CA State Contract Bus Pricing Report adjusted annually at the PPI rate and inclusive of tax.
    - The Battery Electric 35'/40' prices include $50K for extended battery warranty & $120K for configurable options
    - The Fuel Cell Electric 35'/40' prices include $11k for extended fuel cell battery warranty & for $120K configurable options
- The Electric Cutaway price is based on the CA State Contract and also includes $50K for extended battery warranty & $75K for configurable options.
- The Fuel Cell Cutaway price is based on the battery-electric cutaway price + $100,000 for fuel cell components (based on comparable costs for fuel cell trucks)

and also includes $11k for extended fuel cell battery warranty & $75K for configurable options.

- The local sales tax (7.25%) is applied to the base price.
- The nominal cost of the bus capital remains level over the ZEB transition period.

For bus lengths that are not currently available in the market for a specific technology the costs in **Table 10** were used. The price for a 40' bus was used as an estimate for a 35' FCEB.

*Table 10 - Fleet Assessment Cost Assumption*

| | **Fuel Type** | | | | |
|---|---|---|---|---|---|
| **Length** | CNG | Gas | Diesel | Electric | Fuel Cell |
| **Cutaway** | NA | $70,000 | NA | $381,000 | $446,000* |
| **35'** | NA | NA | $575,000 | $967,000 | $1,262,000* |
| **40'** | $399,000 | NA | $600,000 | $978,000 | $1,262,000 |

*Bus size not currently available for this technology

## Baseline Scenario

In the Baseline scenario, BCAG continues to replace retired buses at the end of their useful life, with vehicles of the same fuel type and length as currently operates in its 2021 fleet. The exceptions to this replacement strategy are the BEBs that BCAG is already in the process of procuring. As previously noted, six BEBs are expected to be purchased in 2022 and put into service in 2023 although only two are currently shown in the graphs below since the purchasing plan changed after CTE conducted the transition plan analysis. These vehicles were included in the Baseline since they are agnostic to the full fleet transition and will not influence scenario selection. This scenario illustrates the costs that BCAG would expect over the 20-year period if it maintained its current fleet composition including the BEBs that are part of the agency's near-term procurement plans.

**Figure 8** shows the number of diesel buses and BEBs that would be purchased each year through 2040 in this scenario. As of May 2021, the bus fleet consists of 32 fixed route buses: 30 diesel buses and 2 CNG buses. Their paratransit fleet consists of 22 gasoline-powered cutaway vehicles (28-feet). The baseline also includes BCAG's previous known procurements of 2 BEBs in 2022 and 3 more in 2024, which will phase out the last of their

CNG buses. The analysis and figures were based on the procurement plans that were available at the time, and have not been updated to take into account the revised bus procurement schedule, which will have six BEBs in service by 2023.

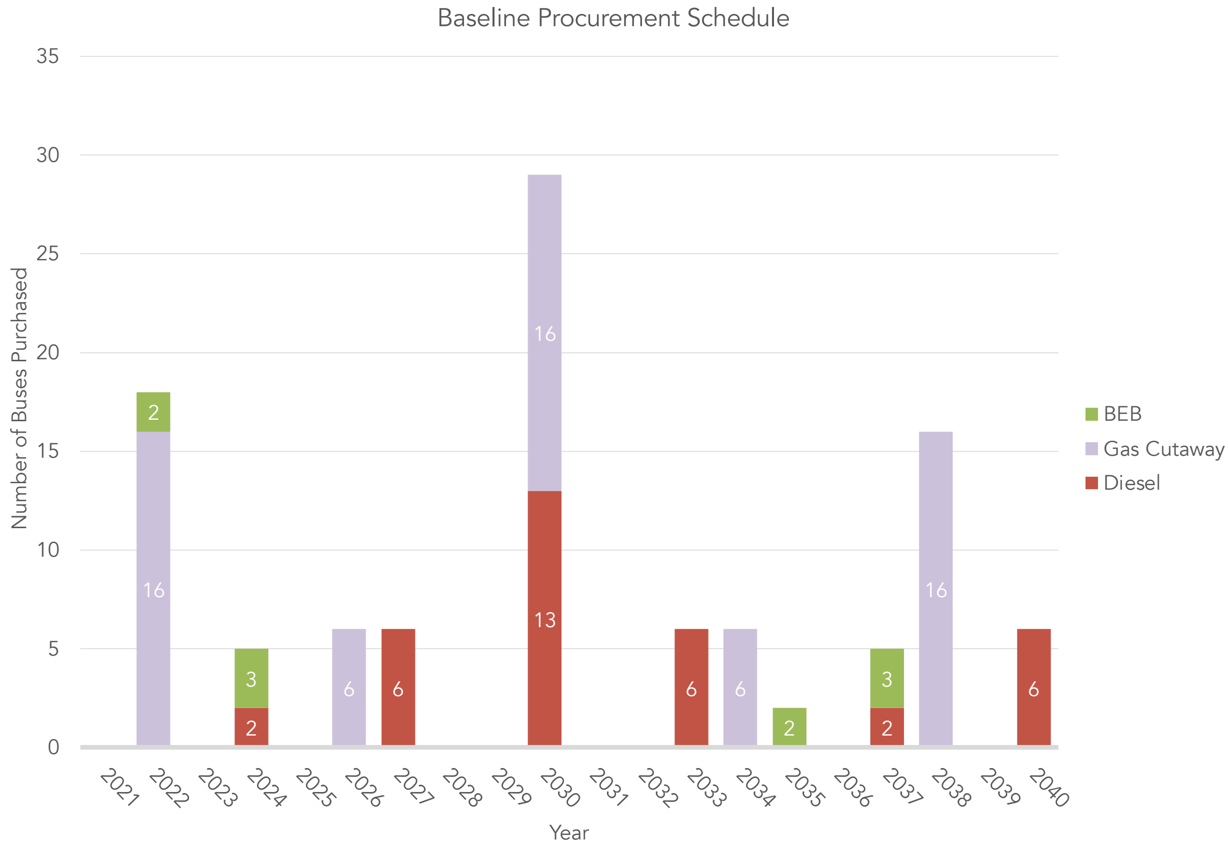



*Figure 8 - Projected Bus Purchases, Baseline Scenario*

**Figure 9** depicts the annual fleet composition through 2040 for the Baseline scenario; the fleet remains composed of primarily diesel over the 20-year period. Note that the CNG buses are scheduled to be replaced with BEB buses in 2022, which is why they are represented in the annual fleet composition for 2021 only. As noted previously, this and the following charts have not been updated with the revised BEB procurement schedule.

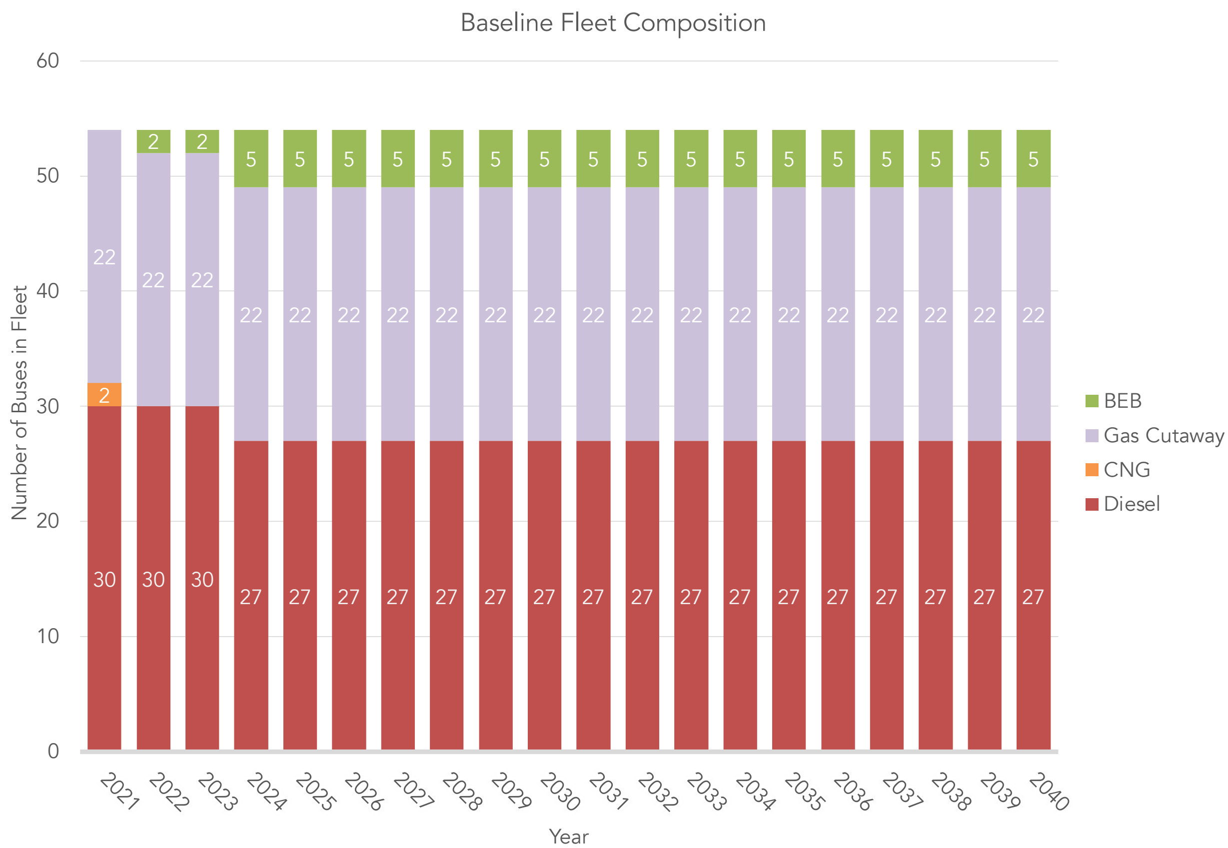



*Figure 9 - Annual Fleet Composition, Baseline Scenario*

**Figure 10** shows the annual total bus capital costs for the diesel and battery electric buses purchased in each year in the Baseline scenario that corresponds with the procurement schedule outlined in **Figure 8** that reflects the planned purchases as of 2021.

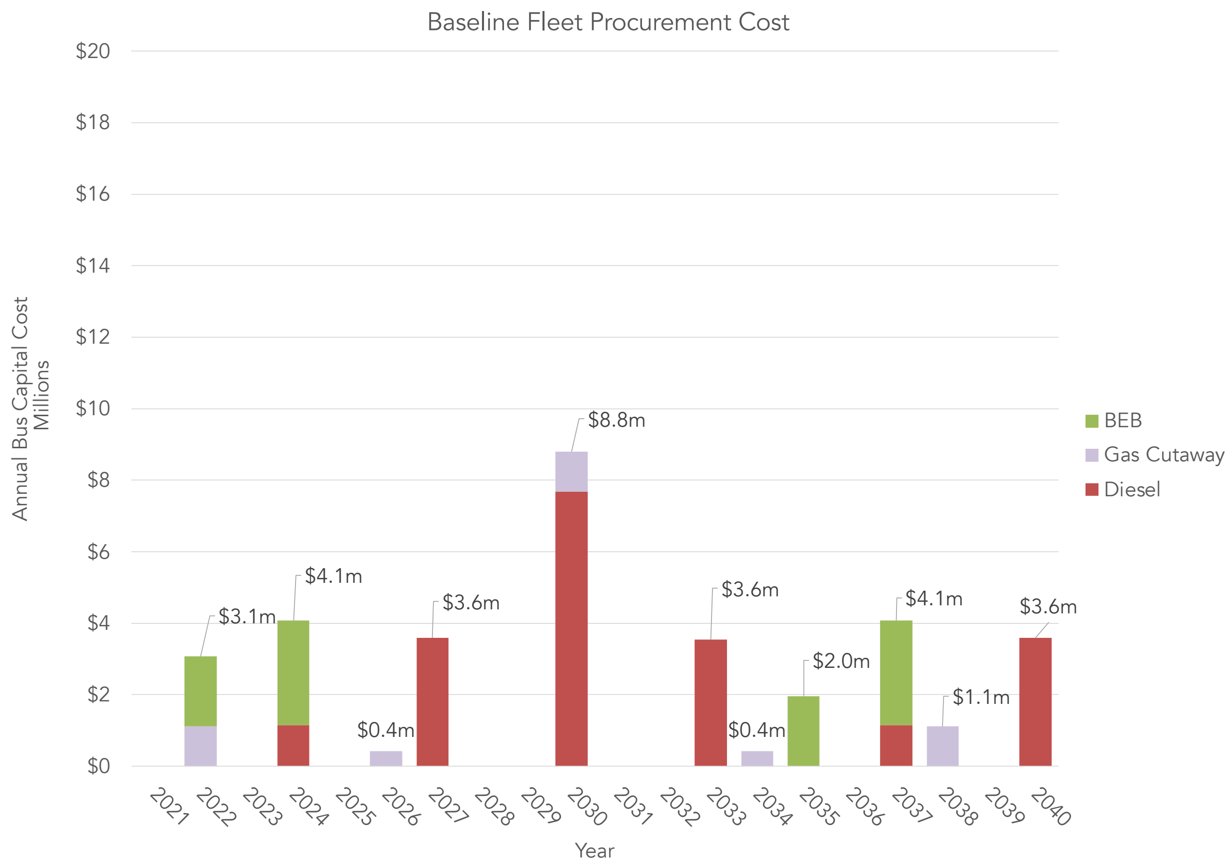



*Figure 10 - Annual Capital Costs, Baseline Scenario*

## BEB Only Scenario

In the BEB Only scenario, BEBs are purchased and deployed only on blocks that are within a BEB's achievable range as determined by CTE's modeling. As discussed, according to CTE's modeling, all of B-Line's fixed route service is feasible with depot-only charged BEBs by 2035 therefore an on-route charging scenario was not explored in this study. Based on CTE's modeling, battery-electric cutaways were determined to lack the range required to support B-Line's paratransit and dial-a-ride service requirements, so cutaways were assumed to remain gas for the time being, but BCAG will continue to monitor improvements in this technology and will re-assess this decision when an Altoona tested cutaway's battery capacity approaches BCAG's requirements. This scenario assumes that BCAG will be in compliance with the 25% ZEB purchase requirement starting on January 1st, 2026 after purchasing six BEBs that are included in their procurement schedule from 2021 to 2025, which will be eligible for submittal in 2027 to meet the purchasing requirement and allow BCAG to offset the purchase requirement in that year.

**Figure 11** depicts the number of buses by type that are scheduled to be purchased per year (as of the 2021 procurement schedule) in the BEB Only scenario. In this scenario, 2 BEBs are introduced in 2022, 3 BEBs in 2024, 13 BEBs in 2030, 6 BEBs in 2033, 2 BEBs in 2037, and 6 BEBs in 2040.

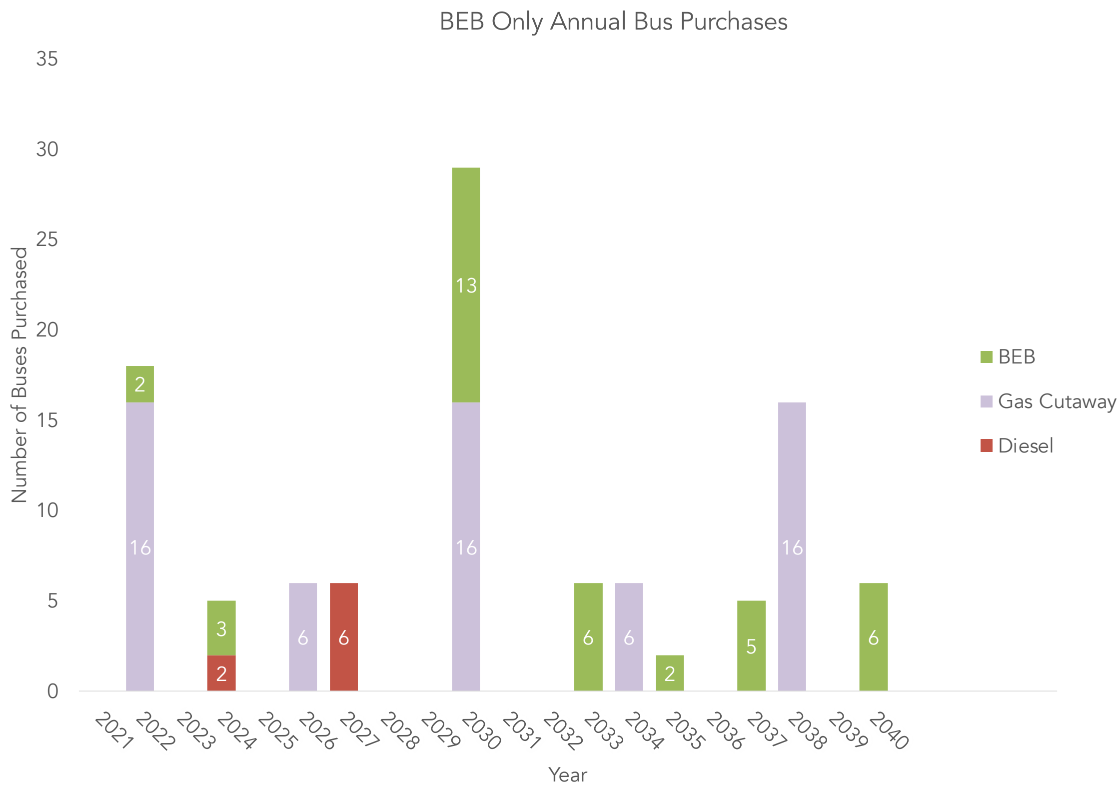



*Figure 11 - Projected Bus Purchases, BEB Only Scenario*

**Figure 12** shows the fleet composition year-by-year that results from the procurement schedule shown above. Diesel buses will remain in B-Line's fleet until 2039 since BCAG will purchase diesel buses until 2030 in favor of reserving ZEB purchases later in the timeline for improved technology. As previously discussed, BCAG has the opportunity to request waivers if zero-emission technology has not matured enough to meet all service requirements. Since battery-electric cutaways were assessed to have insufficient range to meet B-Line's non-fixed-route service, B-Line does not plan to convert their cutaway fleet to this zero-emission technology at this time.

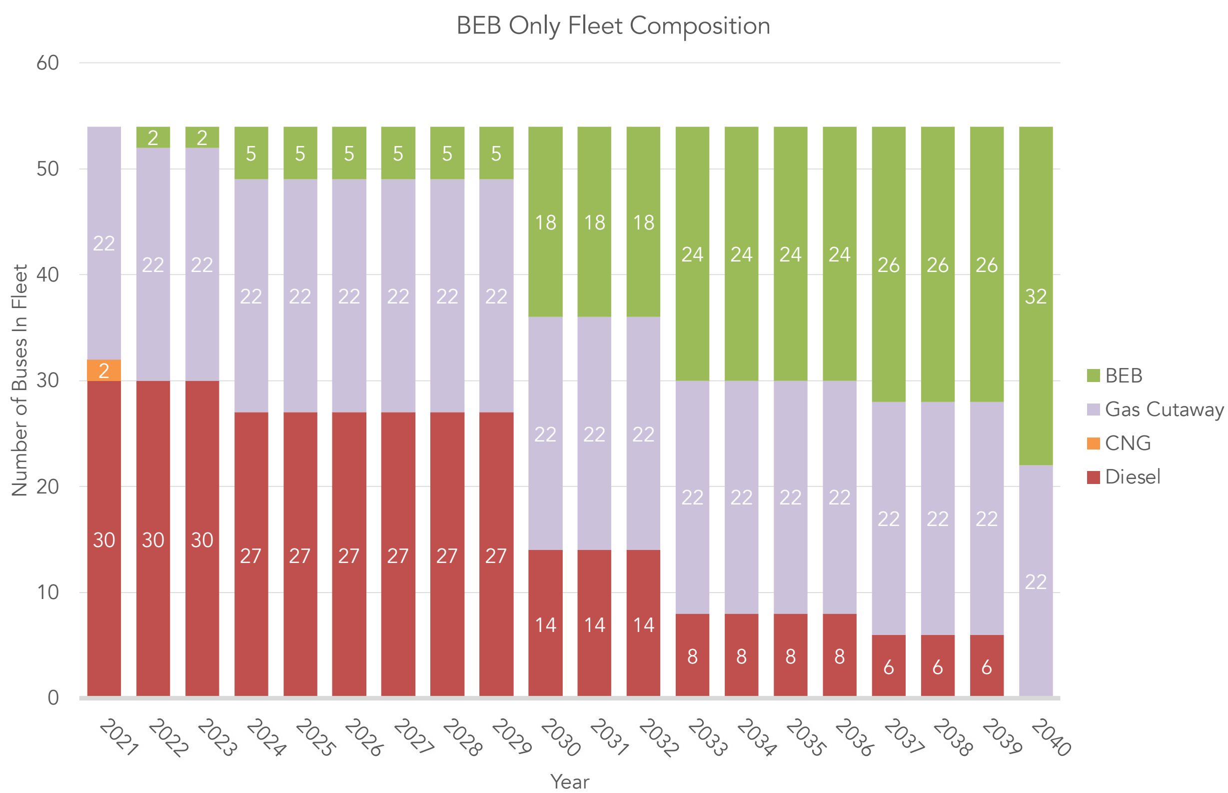



*Figure 12 - Annual Fleet Composition, BEB Only Scenario*

**Figure 13** shows the annual total bus capital costs for the diesel and battery electric buses purchased in each year in the BEB Depot-Only scenario. 2030 is a major purchase year, with 13 BEBs expected for purchase for an estimated $13.8 million.

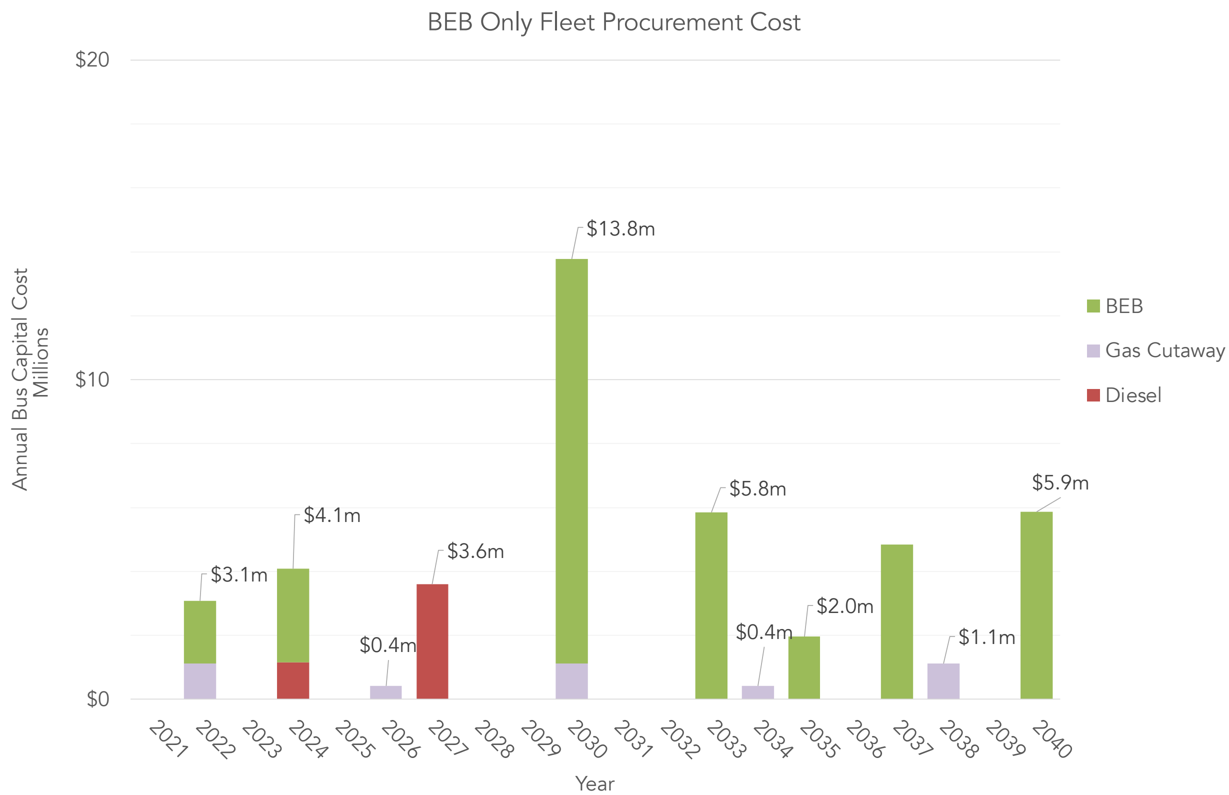



*Figure 13 - Annual Capital Costs, BEB Only Scenario*

## Mixed Fleet – BEB Majority Scenario

Two Mixed Fleet (BEB and FCEB) scenarios were developed to review the costs and benefits associated with a mixed fleet. While BEB technology can complete all of B-Line's existing routes, BCAG prioritizes redundancy and resilience given their service plan covers areas that have recently been affected by fires and flooding. A mixed fleet that includes different technology and fuel is more resilient as it would allow service to continue if either fuel became temporarily unavailable for any reason. A BEB Majority Mixed Fleet Scenario was developed to explore the pros and cons of a mixed fleet that is 75% BEB, 25% FCEB. In this scenario, BCAG also elected to transition 20% of their cutaway fleet to zero-emission fuel-cell vehicles for all scenarios containing FCEBs. As in the BEB Only Scenario, this scenario assumes that BCAG will offset the 2027 purchasing requirement that would require 25% of that year's purchases to be zero-emission by submitting two BEBs that will already be in the fleet prior to the purchasing requirement.

**Figure 14** shows the number of ZEBs that would be purchased each year from 2021 through 2040 in this scenario based on the purchasing schedule that was expected in 2021 although that has since changed to include more BEBs by 2024. In the Mixed Fleet – BEB Majority scenario, 8 FCEBs and 4 fuel cell electric cutaways will be purchased in 2030 along with 5 BEBs. Proceeding bus procurements will prioritize BEBs while roughly 20% of cutaway purchases will be reserved for fuel cell electric cutaways.

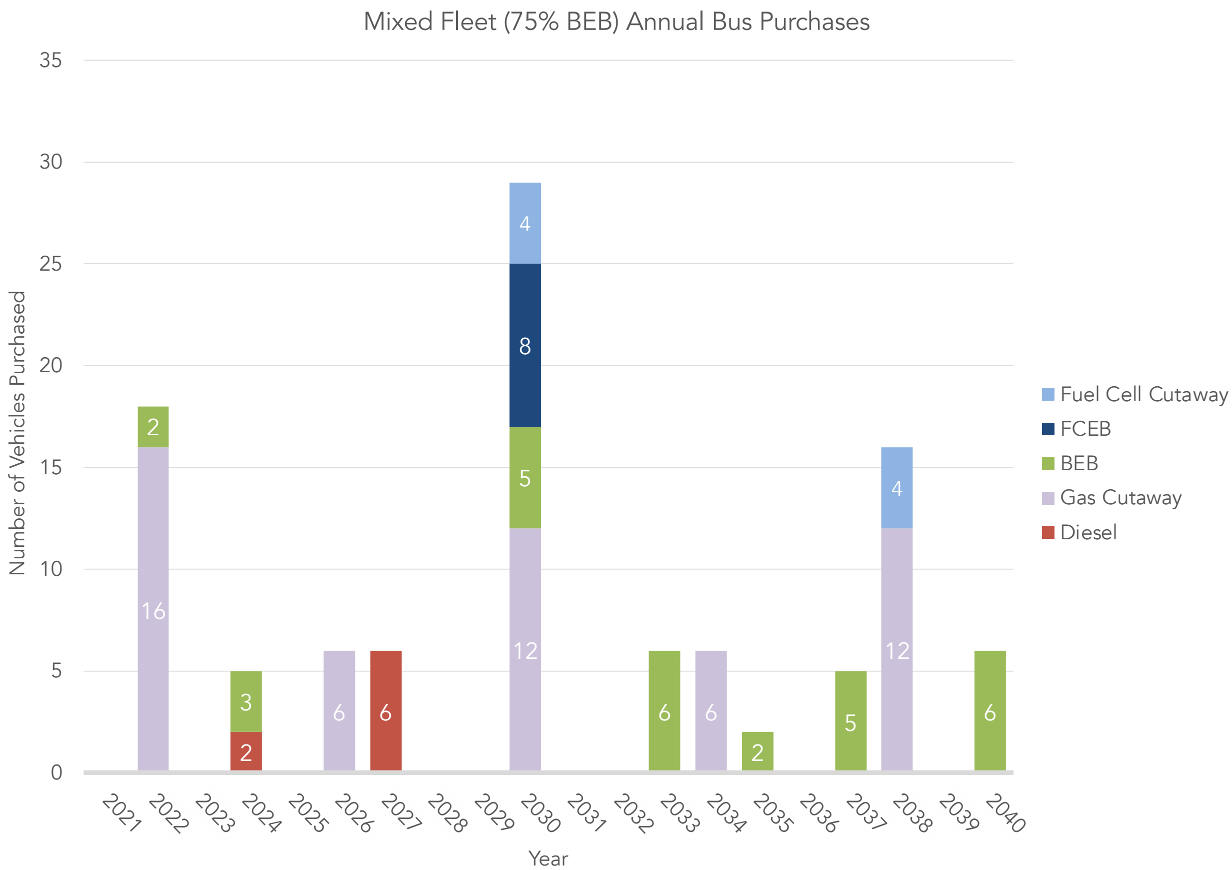



*Figure 14 - Projected Bus Purchases, Mixed Fleet - BEB Majority*

**Figure 15** depicts the annual fleet composition through 2040 for the Mixed Fleet - BEB Majority scenario. As in all the scenarios, BCAG will procure 5 BEBs between 2022 and 2024. In this scenario, 5 more BEBs are added in the fleet composition in 2030, 6 more BEBs in 2033, 2 in 2037, and finally 6 in 2040. Additionally, 8 FCEBs and 4 fuel cell electric cutaways are procured in 2030. Note that the fleet will have small portion of diesel buses until they are fully phased out in 2039. Gasoline-powered cutaways will remain the majority of B-Line's paratransit fleet due in part to is resilience and redundancy strategies.

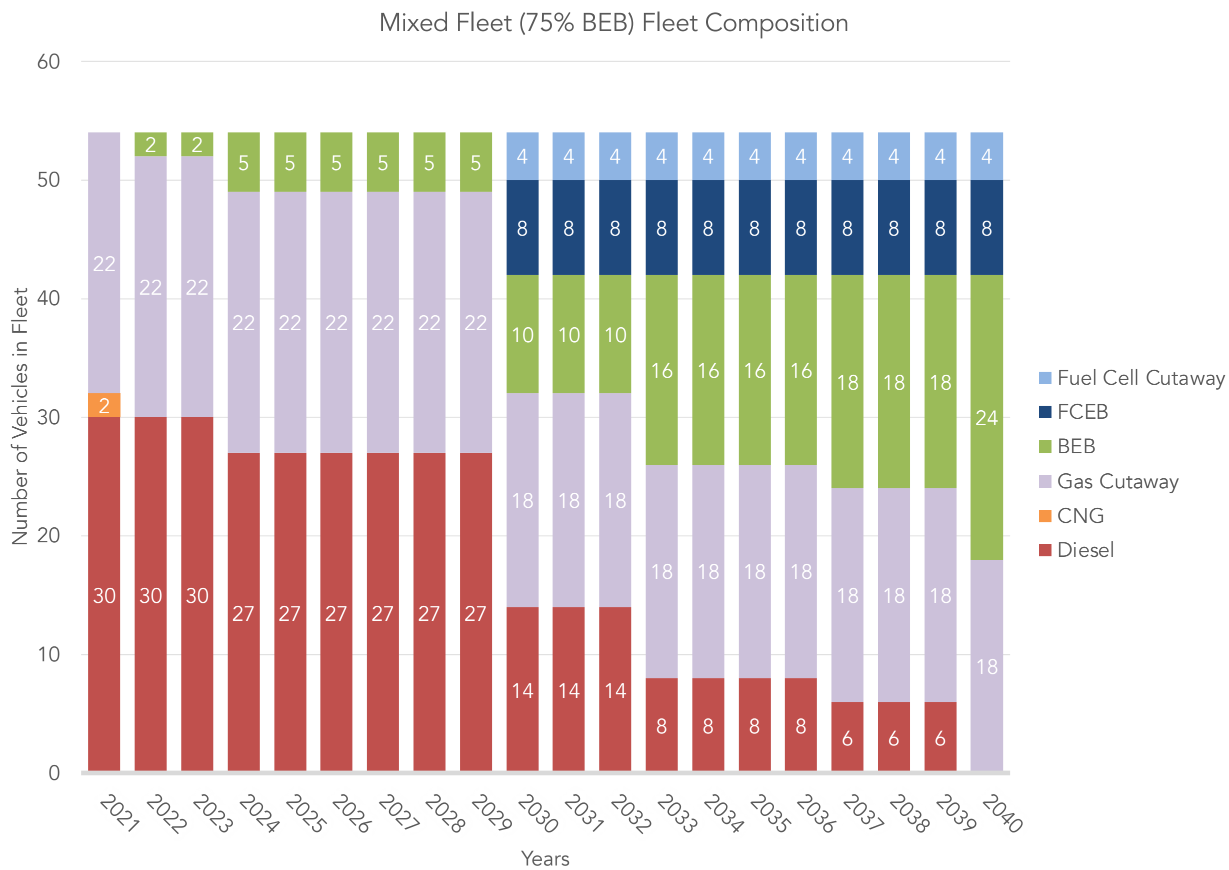



*Figure 15 - Annual Fleet Composition, Mixed Fleet - BEB Majority*

**Figure 16** shows the annual total bus capital costs in the Mixed Fleet - BEB Majority Scenario. 2030 is a major purchase year when 13 diesel buses will reach the end of their 12-year useful service life and 16 gasoline powered cutaways will reach the end of their 7-year useful life.

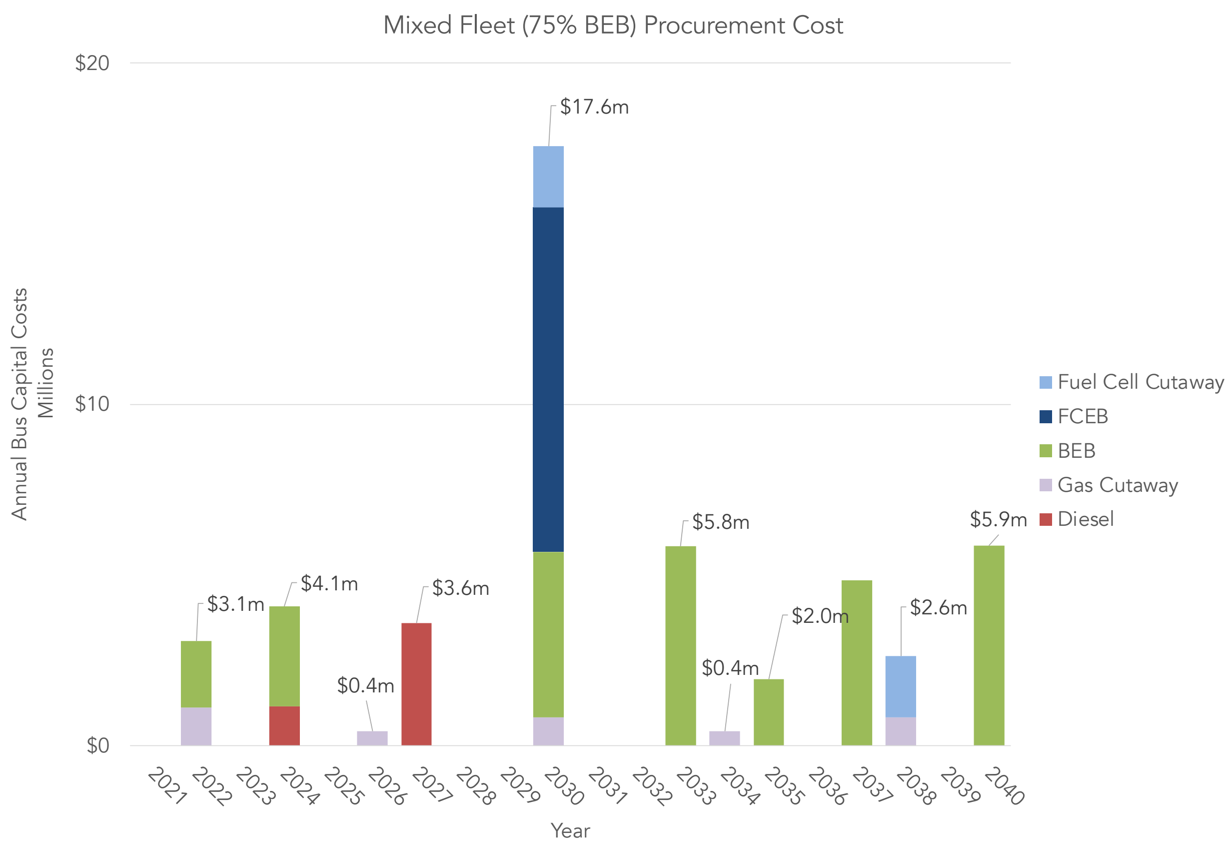



*Figure 16 - Annual Capital Cost, Mixed Fleet - BEB Majority*

## Mixed Fleet - FCEB Majority Scenario

The second Mixed Fleet (BEB and FCEB) scenarios was developed to review the costs and benefits associated with a FCEB fleet majority. This scenario also assumes that BCAG will be in compliance with the 25% ZEB purchase requirement starting on January 1st, 2026 by submitting two of the six BEBs that are included in their procurement schedule from 2022 to 2025.

**Figure 17** shows projected purchases, annual fleet composition, and annual total capital costs for the Mixed Fleet - FCEB Majority scenario based on the purchasing schedule anticipated as of spring 2021. In this scenario, 13 FCEBs and 4 fuel cell cutaways are scheduled for purchase in 2030. Two additional FCEBs are introduced into B-Line's fleet composition in 2033, five FCEBs in 2037, and finally four FCEBs in 2040. Keeping in line with BCAG's request for a 20% fuel cell electric paratransit fleet, the cutaway fleet composition consistently maintains four fuel cell cutaways.

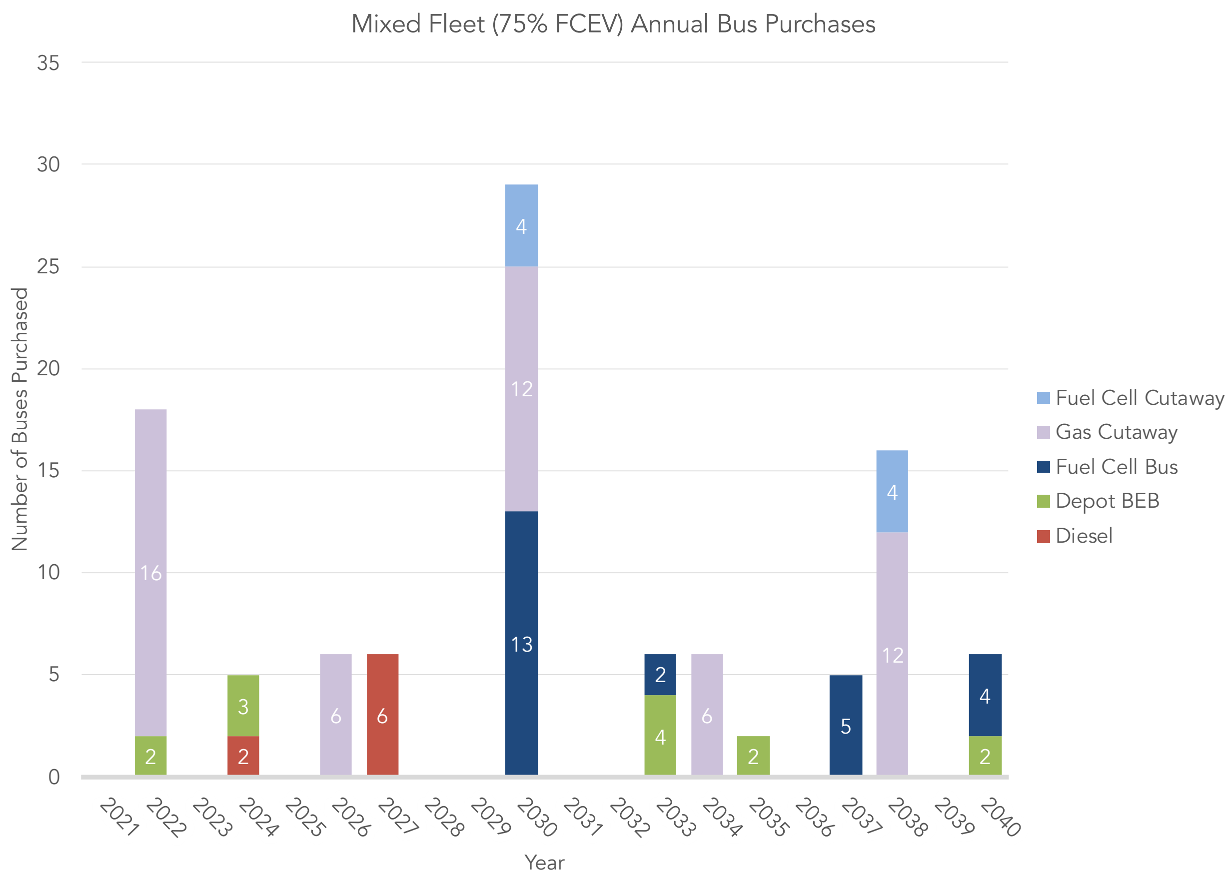



*Figure 17 - Projected Bus Purchases, Mixed Fleet (75% FCEB)*

**Figure 18** depicts the annual fleet composition through 2040 for the Mixed Fleet - FCEB Majority scenario. In contrast to the Mixed Fleet - BEB Majority scenario, FCEBs make up the majority of the bus purchases starting in 2030.

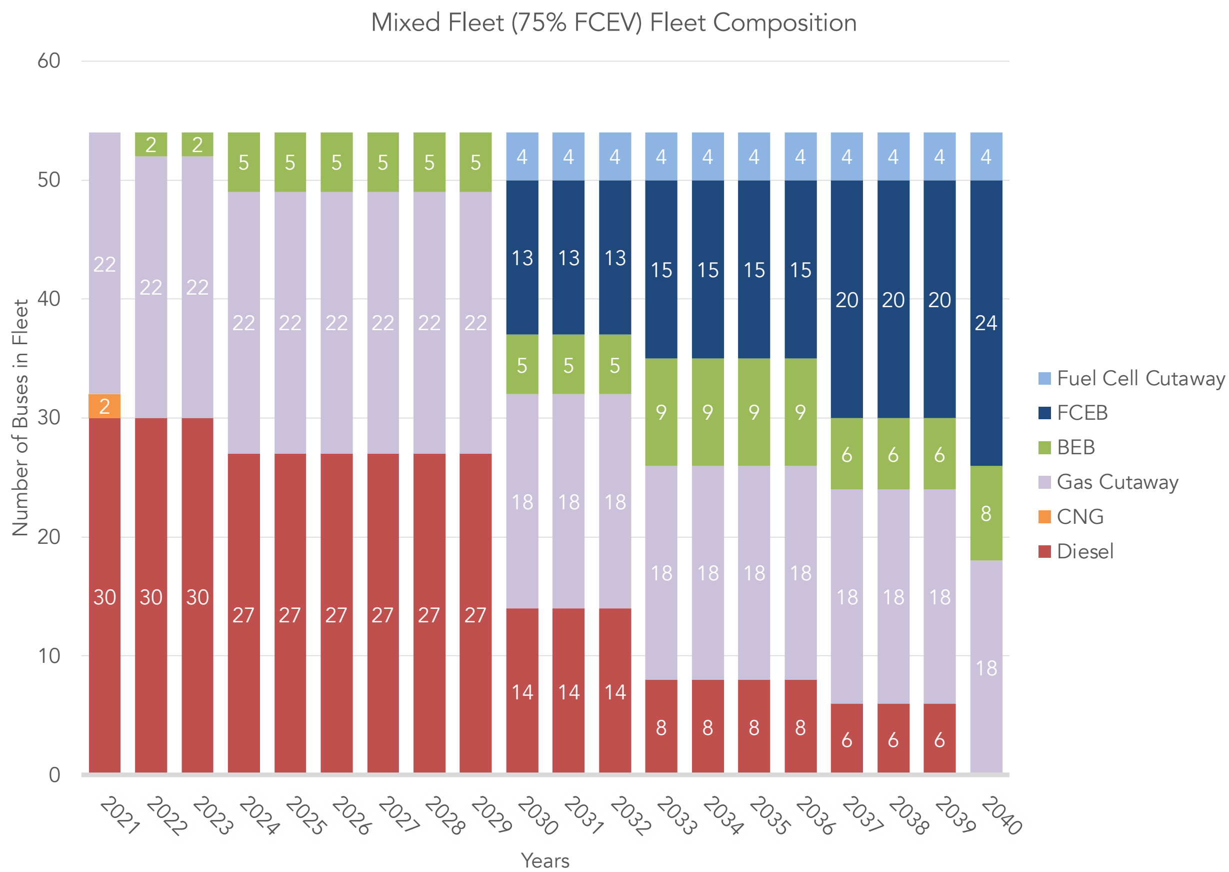



*Figure 18 - Annual Fleet Composition, Mixed Fleet - FCEB Majority*

**Figure 19** shows the annual bus capital cost for the Mixed Fleet - FCEB Majority scenario. While the same number of diesel buses are being replaced in this scenario as in the Mixed Fleet - BEB Majority scenario, the bus capital cost is increased due to higher prices for FCEB technology. As seen in the previously discussed scenarios, 2030 is a major purchase year with estimated annual expenditures of $19 million.

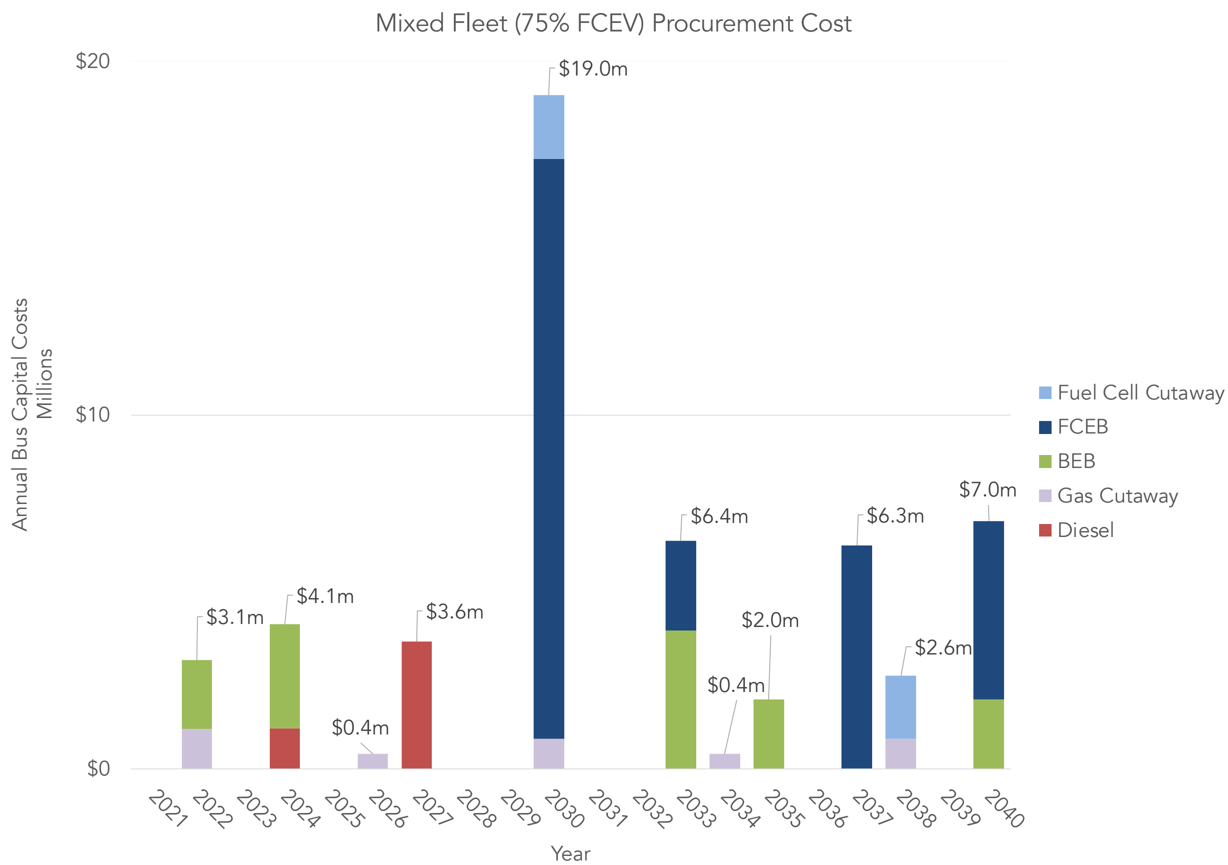



*Figure 19 - Annual Capital Cost, Mixed Fleet (75% FCEB)*

## FCEB Only Scenario

The FCEB Only scenario was developed to examine the costs for hydrogen fueling and transitioning to a 100% FCEB fleet. This scenario includes BCAG's known BEB procurements (as of 2021), but anticipates replacing those five BEBs with FCEBs in the second purchasing round. This scenario also assumes that BCAG will be in compliance with the 25% ZEB purchase requirement starting on January 1st, 2026 after purchasing 2 of the 6 BEBs that are included in their procurement schedule from 2021 to 2025. Maintenance costs are highly dependent on the size and complexity of the vehicle fleet being supported. There are efficiencies gained in maintaining a single technology versus in a mixed fleet scenario where maintenance of both hydrogen equipment and charging infrastructure will need to be considered. The figures below show projected purchases, annual fleet composition, and annual total capital costs for the FCEB Only scenario.

By 2040, B-Line is able to replace 100% of its fixed route fleet with FCEBs, as well as 20% of their cutaway fleet.

**Figure 20** shows the number of buses scheduled for purchase per year in the FCEB Only scenario. In this scenario, beyond the 5 known BEB procurements, diesel and gasoline powered vehicles are replaced with fuel cell technology starting with 4 fuel cell cutaways and 16 FCEBs in 2030. 8 additional FCEBs are procured in 2033; 8 FCEBs in 2035; 9 FCEBs in 2037, and finally 2 FCEBs in 2040.

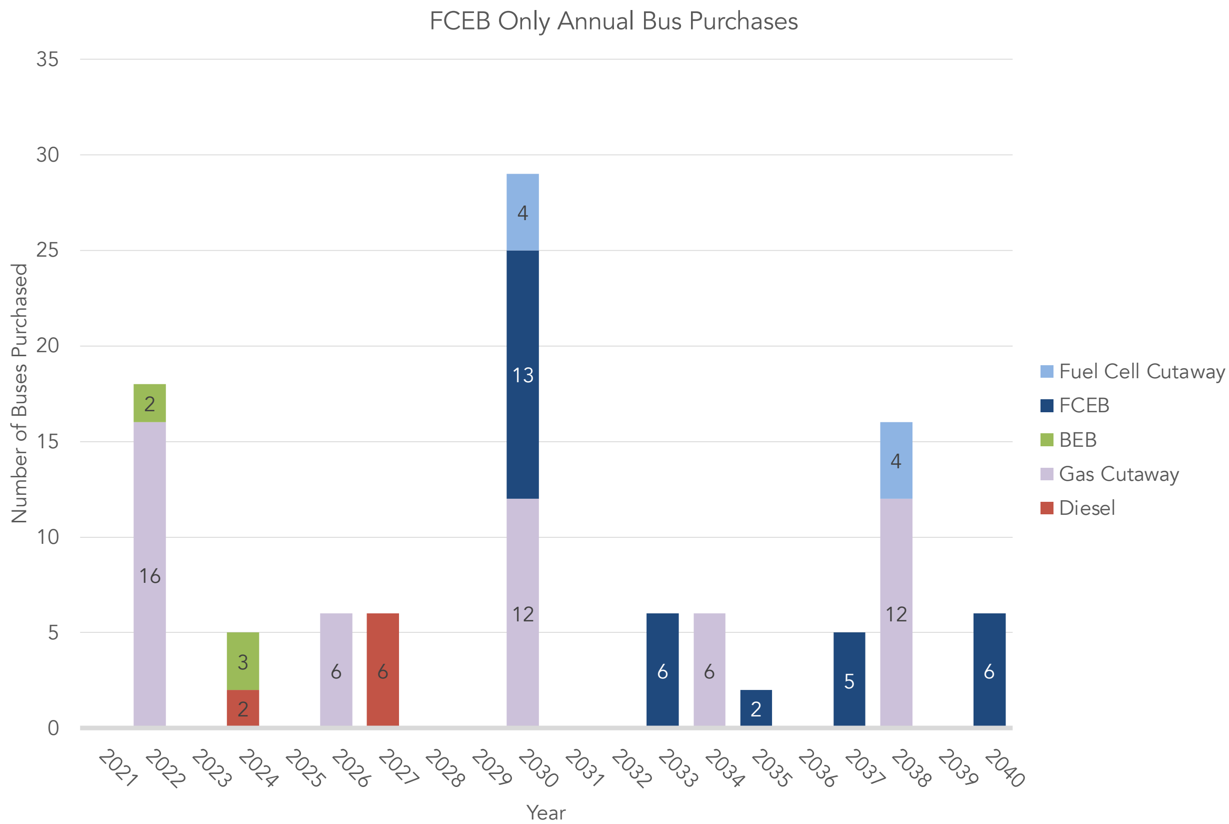



*Figure 20 - Projected Bus Purchases, FCEB Only Scenario*

**Figure 21** shows the annual fleet composition for the FCEB Only Scenario. Diesel buses are replaced with FCEBs at a 1:1 ratio starting in 2029. BEBs are fully phased out by 2036 and diesel buses are fully phased out by 2040.

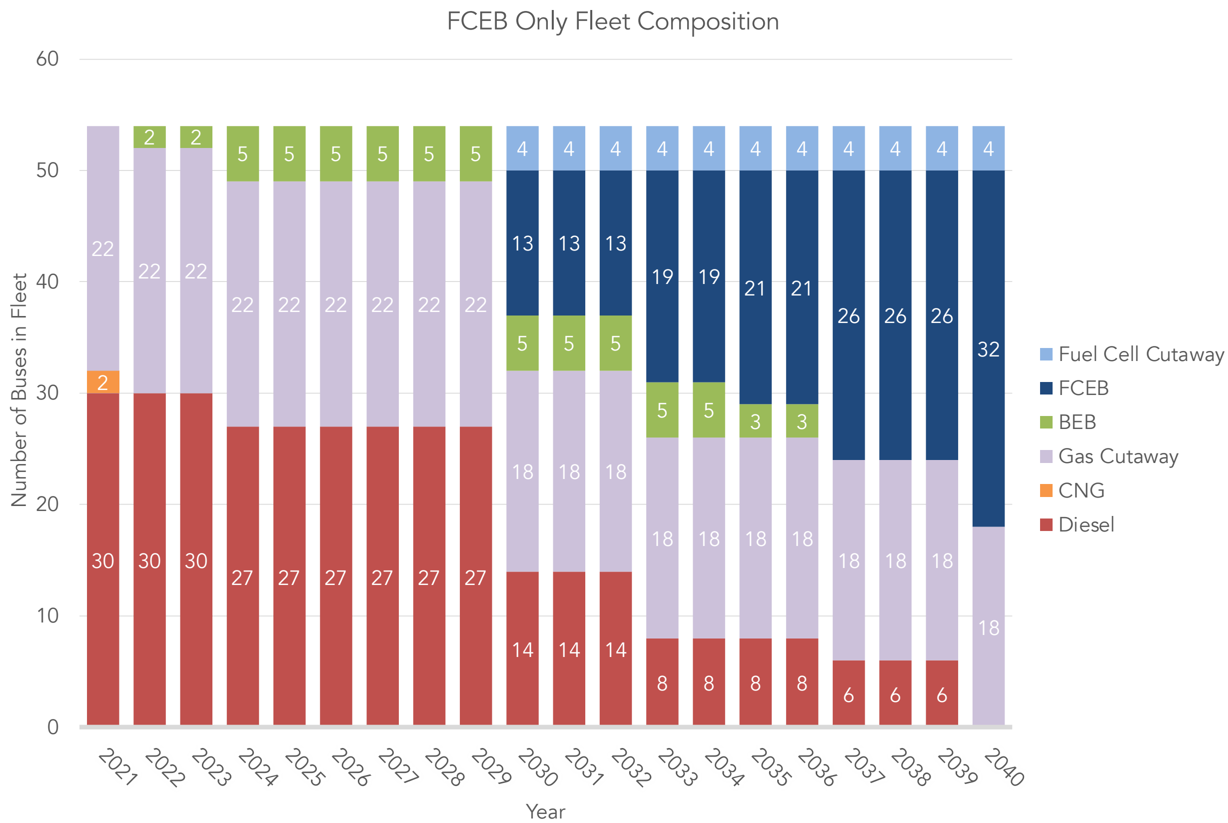



*Figure 21 - Annual Fleet Composition, FCEB Only Scenario*

**Figure 22** shows the annual bus capital cost for the FCEB Only scenario. 2030 is a major purchase year with estimated annual expenditures of $19 million.

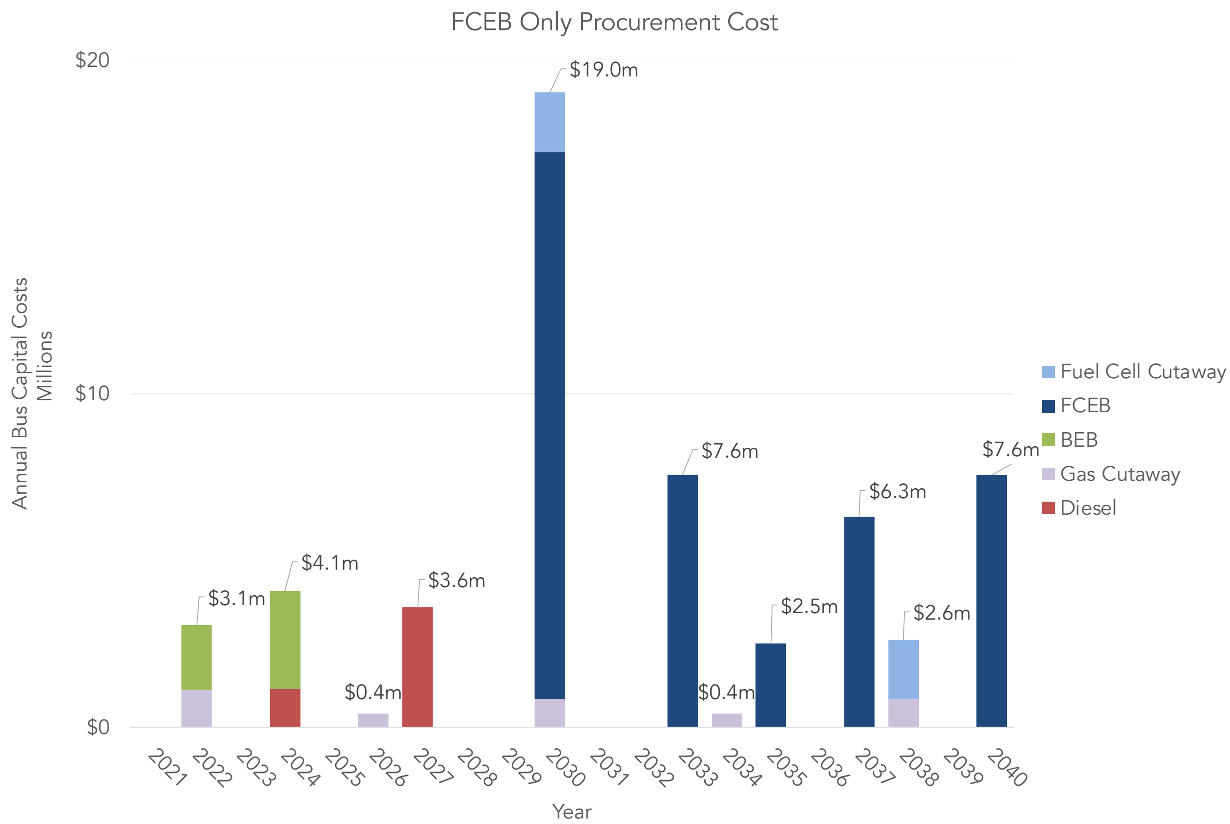



*Figure 22 - Annual Capital Costs, FCEB Only Scenario*

## Fleet Assessment Cost Comparison

The transition and fleet composition schedules were used to develop the total capital cost for bus purchases through the transition period.

**Figure 23** shows the cumulative bus purchase capital costs for each scenario.

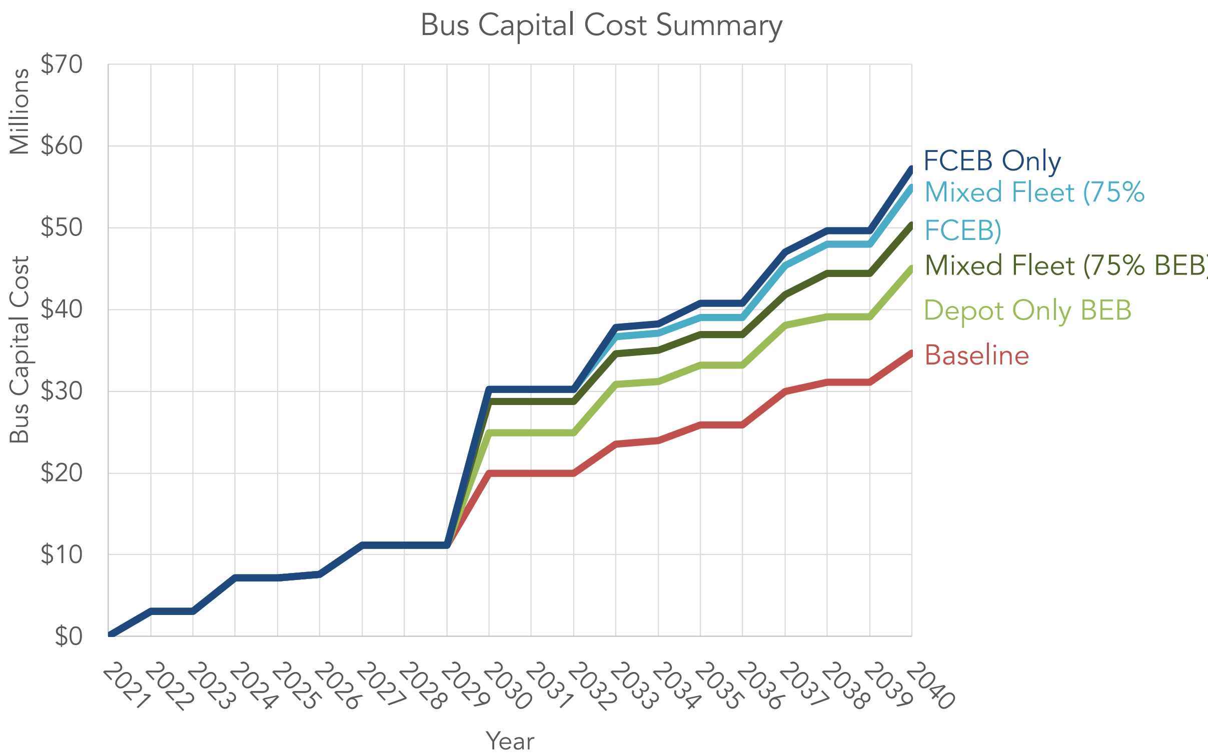



*Figure 23 - Cumulative Bus Capital Costs, Fleet Assessment*

By the end of the transition period, the cumulative bus capital costs vary substantially according to the technology selected with all transition scenarios. **Table 11** summarizes the combined total costs for each transit scenario and the percentage of ZEBs present in the fleet in 2040 for the scenario. Although all of the transition scenarios achieve a fully zero-emission fleet for the agency's fixed route service, there is a $12M difference between the least expensive (BEB Only) and most expensive (FCEB Only) transition scenario.

*Table 11 - Total Bus Capital Costs, Fleet Assessment*

| Scenario | Cost | % ZEB in 2040 For Fixed -Route Fleet | % ZEB in 2040 For Total Fleet |
|---|---|---|---|
| **Baseline (current technology)** | $35M | 15.6% | 9.3% |
| **BEB Only** | $45M | 100.0% | 59.3% |
| **Mixed Fleet - BEB Majority** | $50M | 100.0% | 66.7% |
| **Mixed Fleet - FCEB Majority** | $55M | 100.0% | 66.7% |
| **FCEB Only** | $57M | 100.0% | 66.7% |

# Fuel Assessment

The Fuel Assessment estimates fuel consumption and costs for each of the technologies—diesel, electric, and hydrogen—studied in the relevant scenario.

Using ZEB performance data from the route simulation, CTE analyzed expected bus performance on each block in BCAG's service catalog to calculate the daily fuel required for that block's completion. CTE completed this analysis for each of the four zero-emission fleet transition scenarios and the baseline scenario. The analysis produced estimates of the fuel costs for each projected fleet composition through the transition period. Operation and maintenance costs for BEB and FCEB fueling infrastructure are also included. Fuel cost estimates are based on the assumptions shown in **Table 12** below.

*Table 12 - Fuel Cost Assumptions*

| Fuel | Cost | Source |
|---|---|---|
| **Diesel** | $3.80/DGE | Based on the average of BCAG's reported price in calendar year 2019 to 2020. |
| **CNG** | $1.79/ Therm | Based on the average of BCAG's reported price in calendar year 2019 to 2020. |
| **Gasoline** | $3.60/GGE | Based on the average of BCAG's reported price in calendar year 2019 to 2020. |
| **Hydrogen (liquid)** | $7.95/kg | Based on OCTA's 2017 contractual price of liquid hydrogen (trucked in). Cost is inclusive of hydrogen fueling station maintenance by provider. |
| **Electricity** | $0.13/kWh (Off-Peak) | PG&E Commercial EV Tariff Schedule |

The primary source of energy for a BEB is often the local electrical grid. Pacific Gas & Electric (PG&E) is the electricity provider, or utility, for BCAG. PG&E charges customers for energy consumption, measured in kWh, using a time-of-use (TOU) rate. Under a TOU rate, the cost per kWh of electricity varies by time of day.

Demand charges are the costs incurred by an agency's peak power demand. Peak demand is defined as the maximum amount of energy that a customer pulls from the grid for any 15-minute window within a month. Demand charges are then applied on a per-kW basis to that maximum demand. Demand charge is considered for depot and on-route charging. These separate charges are then totaled to produce an agency's electricity bill for the month.

As a transit agency adds more buses and chargers, the agency's energy consumption and the peak power demand both increases. Electricity rates also vary throughout the year and throughout the day, making costs highly variable if charging is not managed. Charge management strategies aim to minimize charging costs by taking advantage of this variability. Charge management strategies include charging buses during times of day at which rates are lower and avoiding demand charges by spreading out the number of buses charging at once to minimize increases in peak power demand. In the scenarios presented in this transition plan, the buses would all depot charge in the off-peak times to help reduce overall fuel cost, which the buses at B-Line can achieve by charging at night.

**Table 13** shows a summary of the PG&E's Electric Schedule BEV-2-S Commercial Electric Vehicles (EV) for Secondary Voltage, which was used in the Fuel Assessment to estimate electricity costs for BEBs. These rates are averaged from monthly rates and are a summarized version of PG&E's full rate schedule. Because this is a TOU rate, the rate per kWh changes based on the time of day and year that the kWh is consumed. Depot-charged buses are assumed to charge entirely during the off-peak hours between 9:00pm and 9:00am. The depot charge rate is therefore the same as the off-peak rate ($0.13 per kWh).

PG&E's Commercial EV Rate allows agencies to subscribe to a set fee of $95.56 per 50 kW of power demand in lieu of traditional demand charges in addition to consumption charges. This standard fee rate applies to the demand at the depot. BCAG will be moved to the new Commercial EV rate structure when their demand exceeds their current rate. The Depot Charge Rate included in the table below represents the average cost per kilowatt-hour expected for BCAG. While some locations have rates that vary by season, BCAG's rates will remain constant year-round.

*Table 13 - PG&E's Electric Schedule BEV-2-S Commercial Electric Vehicles for Secondary Voltage*

| | Per meter charge | Average rates |
|---|---|---|
| **Electric Utility Rates** | On Peak (per kWh) | $0.34 |
| | Off-Peak (per kWh) | $0.13 |
| | Super Off (per kWh) | $0.11 |
| | Depot Charge Rate | $0.13 |
| | Depot Demand Charge (per 50kW/month) | $95.56 |

## Charging Analysis

To accurately estimate energy consumption, peak power demand, and resultant costs, CTE conducted simulations of charging at the depot for each year of the transition. Electrical energy consumption and peak power demand were estimated based on current block schedules and projections of BEB purchases. CTE then used PG&E tariff schedules to calculate the annual cost of charging. This annual cost is evaluated for each year of the study (2021–2040) to obtain a total charging cost of BEBs with depot charging for the transition period. This estimate of total charging cost is used as the total fuel cost for the BEB-Only scenarios and is used in the other fleet scenarios, where relevant, in addition to hydrogen fuel costs, or fossil-fuel costs.

## Hydrogen Pricing, Electricity Pricing, and Sensitivity Analyses

A sensitivity analysis was conducted for BCAG regarding hydrogen pricing because it is widely believed that these prices will fall over time. The high end of the expected price is the current price paid by AC Transit ($8.50/kg), a transit agency in California, and the bottom rate was estimated based on NREL and Department of Energy (DOE) projections at $5.50.[15,16] This pricing sensitivity is shown in the summary and total estimates for the fuel cell scenarios. In contrast, electricity prices are likely to rise in the future, in part due to PG&E's necessary fire safety upgrades to older electrical infrastructure. The electricity

[15] Melaina, M. and Penev, M. 2013. Hydrogen Station Cost Estimates Comparing Hydrogen Station Cost Calculator Results with Recent Estimates. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5400-56412 https://www.nrel.gov/docs/fy13osti/56412.pdf

[16] Hydrogen Production Tech Team Roadmap. 2017. U.S. DRIVE (Driving Research and Innovation for Vehicle efficiency and Energy sustainability). Washington, DC: Department of Energy. https://www.energy.gov/sites/prod/files/2017/11/f46/HPTT%20Roadmap%20FY17%20Final_Nov%202017.pdf

price increases are expected to translate into an increase in cost of 3.2% per year.[17] This price was included as part of a sensitivity analysis for electricity pricing. Because hydrogen and electricity pricing are expected to move in opposite directions, the near-term electricity price is the least expensive whereas the near-term hydrogen price is the most expensive.

## Baseline

The Baseline scenario assumes the same service and ICE technology, apart from the five BEBs that are part of the agency's near-term procurements. **Figure 24** depicts energy consumption by fuel type over the transition period for the Baseline scenario. CTE used B-Line's reported annual fuel consumption in 2019-2020 to calculate the average mile per gallon fuel efficiency per vehicle series in its current fleet. Fleet energy use remains constant over the entire period at around 0.33 million diesel-gallon-equivalent (DGE).

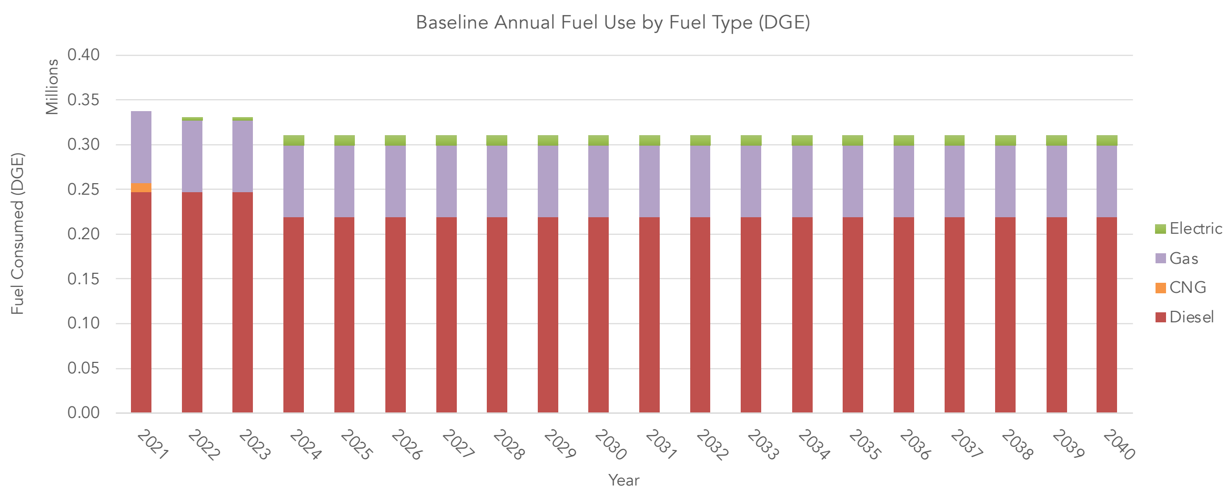



*Figure 24 - Annual Fuel Consumption, Baseline Scenario*

[17] Utility Costs and Affordability of the Grid of the Future. 2021. California: California Public Utilities Commission. https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Feb%202021%20Utility%20Costs%20and%20Affordability%20of%20the%20Grid%20of%20the%20Future.pdf

**Figure 25** shows the annual fuel costs for each fuel type in the Baseline scenario, based on the consumption quantities (in DGE) shown in **Figure 24**. In the Baseline scenario, the fleet is primarily composed of diesel buses. The fleet size, frequency of trips per route, and associated annual mileage are sustained throughout the analysis period and have not been adjusted for inflation. The total estimated fuel costs in 2040, approximately $1.2 million, are slightly less than in 2021 due to efficiencies gained with the 5 BEBs.

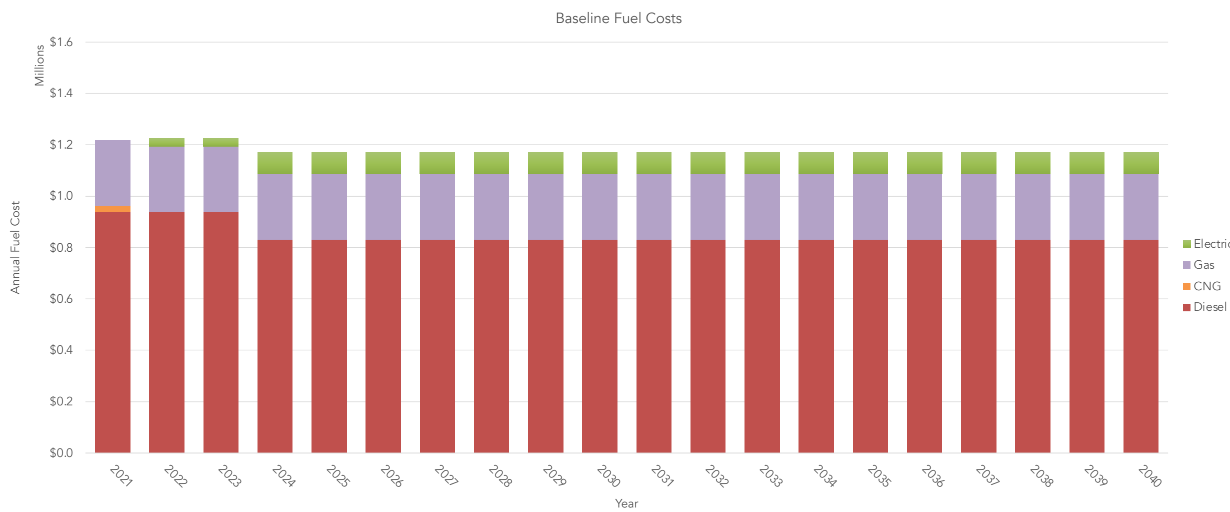



*Figure 25 - Annual Fuel Costs, Baseline Scenario*

## BEB Only

In the BEB Only scenario, BEBs are purchased and deployed only on blocks that are within a BEB's achievable range as determined by CTE's modeling. According to CTE's modeling, all of B-Line's routes are feasible in a BEB with depot-only charging scenario by 2035. **Figure 26** depicts energy consumption for each fuel type over the transition period. Legacy fuels are phased out as electricity consumption increases, reflecting an increasing number of BEBs in the fleet. Fleet energy use is thus reduced from about 0.34 million DGE in 2020 to about 0.16 million DGE in 2040. Fleet energy use is shown to reduce by half in 2040 compared to 2021 fuel consumption levels due to the efficiencies of BEB technology. Since the gasoline cutaways are not assumed to transition to zero-emission technology in this scenario, there is no reduction to the DGE consumption for those vehicles.

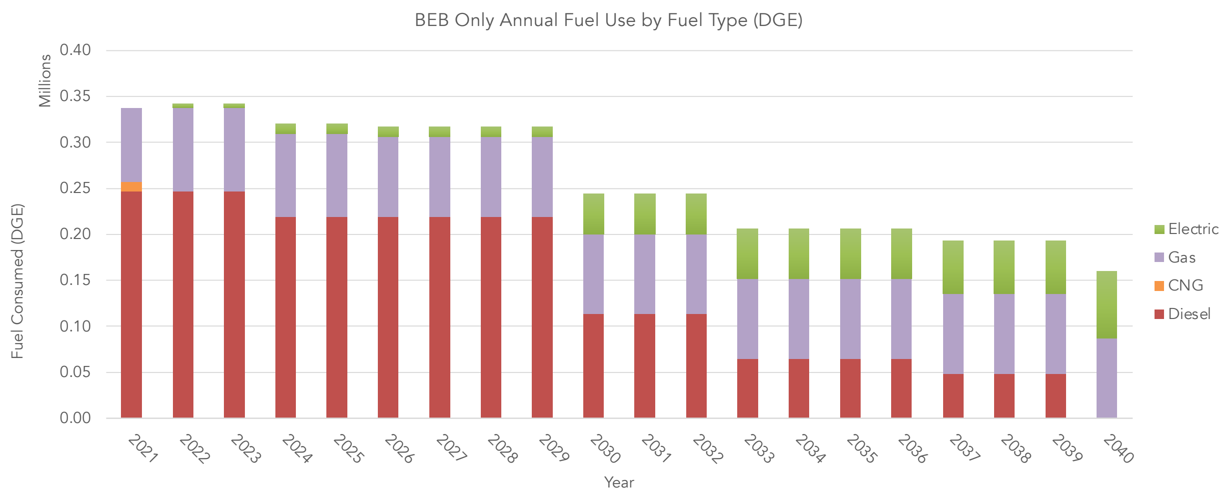



*Figure 26 - Annual Fuel Consumption, BEB Depot-Only*

**Figure 27** shows the annual costs for each fuel type based on the quantities in **Figure 26**. Electricity consumption increases as diesel fuel consumption decreases. The total estimated fuel costs in 2040, approximately $0.8 million, is less than that of the Baseline scenario.

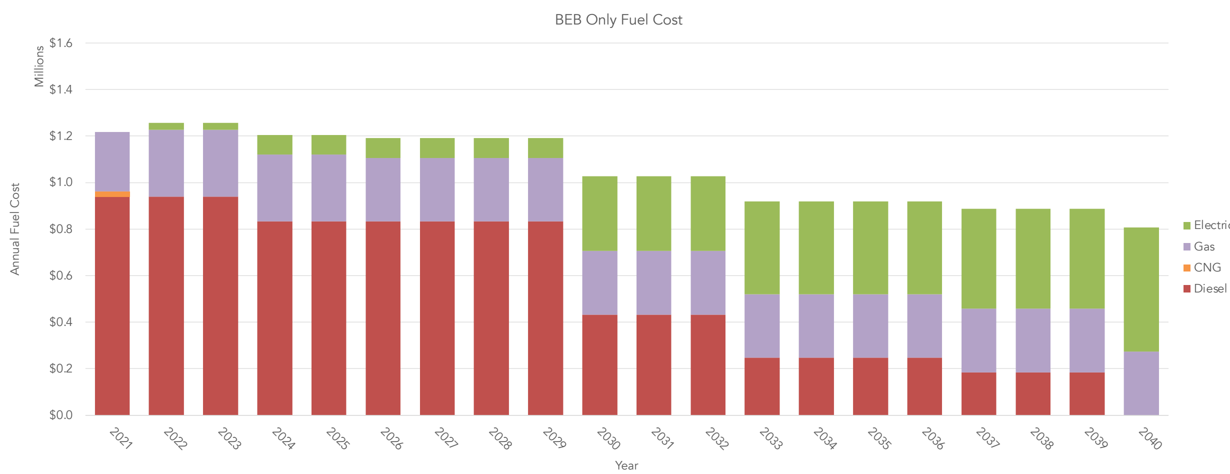



*Figure 27 - Annual Fuel Costs, BEB Depot-Only*

## Mixed Fleet - BEB Majority Scenario

Two Mixed Fleet (BEB and FCEB) scenarios were developed to review the costs and benefits associated with a mixed fleet. While BEB technology can complete all of B-Line's existing routes, BCAG prioritizes redundancy and resilience given that their service plan covers areas that have recently been affected by fires. A mixed fleet that includes different technology and fuel is more resilient as it would allow service to continue if either fuel became temporarily unavailable for any reason.

The Mixed Fleet - BEB Majority scenario compares the advantages and disadvantages of a primarily BEB fleet with that of a primarily FCEB fleet to help with BCAG's scenario selection for their ICT Rollout Plan. The figures below show energy consumption for each fuel type over the transition period and the annual costs for each fuel type within the Mixed Fleet - BEB Majority scenario.

In **Figure 28,** fleet energy use is shown to reduce from about .34 million DGE to under .20 million DGE in 2040 due to the efficiencies of BEB technology. As a reminder, four of B-Line's paratransit vehicles were assumed to transition to FCEBs in all scenarios that explored the technology, so this scenario, as well as all of the following, sees a reduction in the DGE consumed by the paratransit vehicles as a result of their partial transition to ZEVs.

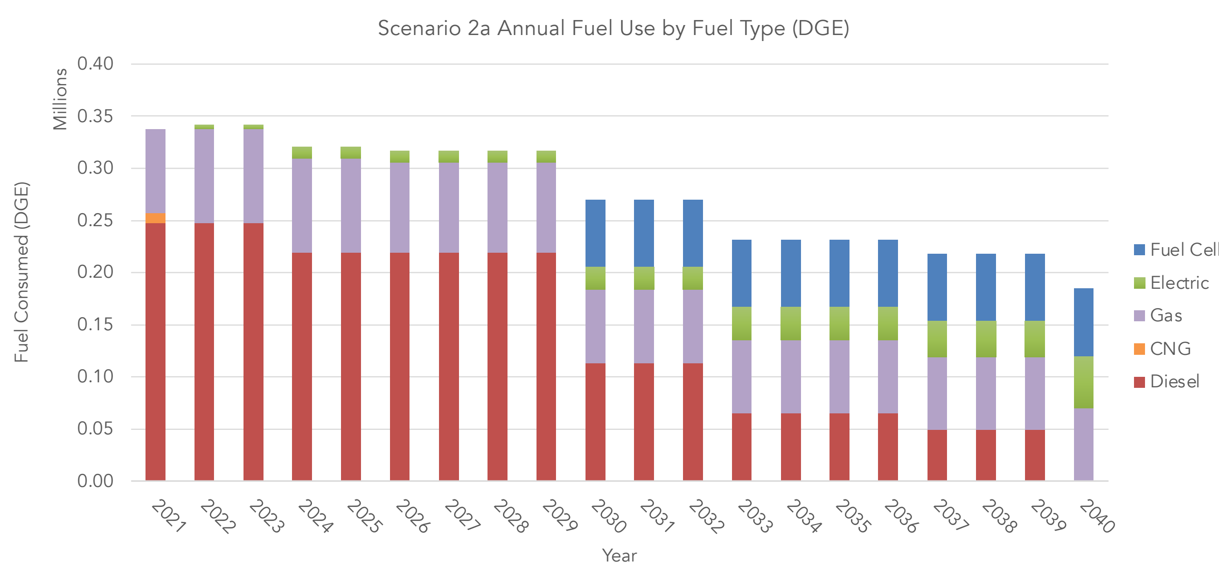



*Figure 28 - Annual Fuel Consumption, Mixed Fleet - BEB Majority*

The total amount of energy consumed by the fleet decreases over the fleet transition period, however, a spike in fuel cost can be seen with the introduction of hydrogen, as shown in **Figure 29**. The prices stabilize and begin to decrease as more diesel buses are retired from the fleet in favor of ZEBs.

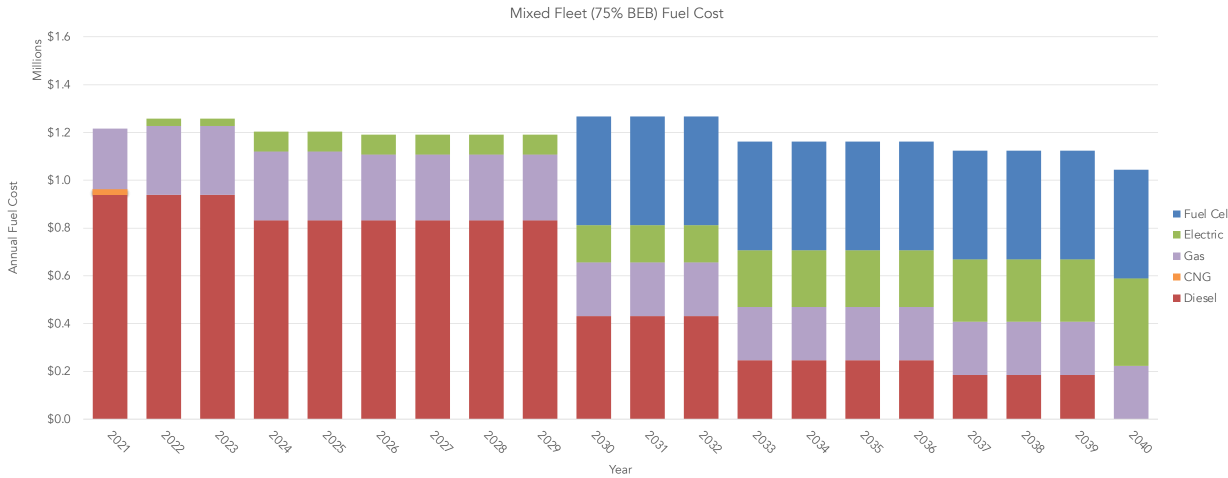



*Figure 29 - Annual Fuel Costs, Mixed Fleet - BEB Majority*

## Mixed Fleet - FCEB Majority Scenario

In this Mixed Fleet Scenario, the majority of the fleet is transitioned to FCEBs, rather than BEBs. **Figure 30** depicts energy consumption for each fuel type over the transition period for the Mixed Fleet - FCEB Majority scenario. Legacy fuels are phased out as electricity and hydrogen consumption increases, reflecting an increasing number of BEBs and FCEBs in the fleet. Fleet energy use is reduced from about 0.34 million DGE in 2021 to under 0.25 million DGE in 2040 as a result of converting to ZEB technology.

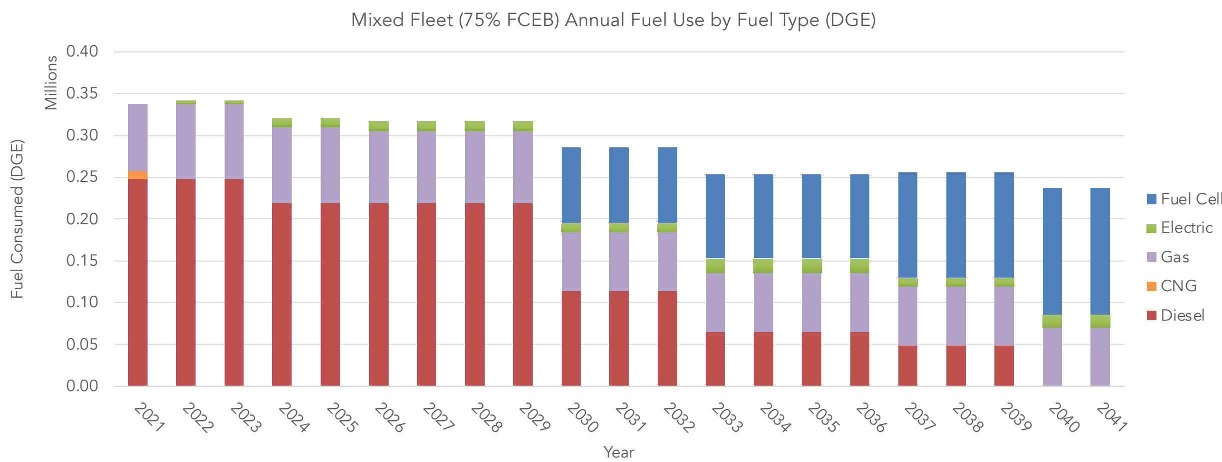



*Figure 30 - Annual Fuel Consumption, Mixed Fleet - FCEB Majority*

**Figure 31** shows the estimated annual costs for each fuel type based on the quantities consumed, as shown in **Figure 30**. Total estimated fuel costs in 2040 are approximately $1.4 million, which are incurred from electricity use for BEBs and hydrogen fuel for FCEBs. Although the total amount of energy consumed decreases over the fleet transition period (**Figure 30)** the total fuel costs increase over that timeframe. These trends reflect hydrogen and electricity's greater efficiency but also hydrogen's higher costs compared to diesel fuel.

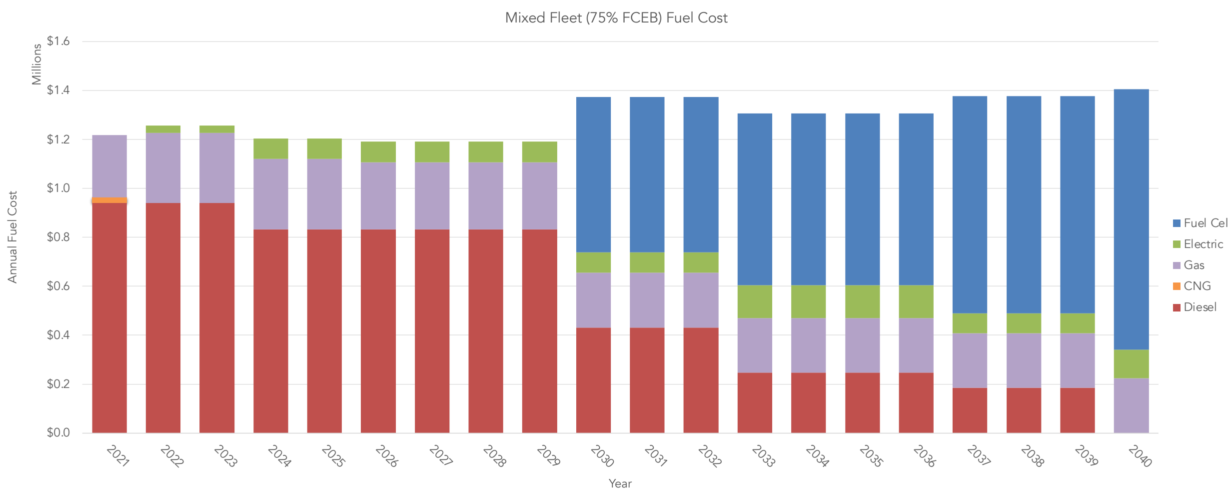



*Figure 31 - Annual Fuel Costs, Mixed Fleet - FCEB Majority*

## FCEB Only

Finally, the FCEB Only scenario was developed to examine the costs for hydrogen fueling and transitioning to a 100% FCEB fleet. A fully FCEB fleet enables all ICE buses to be replaced at a 1:1 ratio. It also avoids the need to install two types of fueling infrastructure by eliminating the need for depot charging equipment. Fleets comprised entirely of fuel cell electric buses also offer the benefit of scalability compared to battery electric technologies. Despite this benefit, the cost of FCEBs and hydrogen fuel renders this scenario the most expensive scenario at current market prices.

**Figure 32** depicts fuel consumption for each fuel type over the transition period for the FCEB Only scenario. Legacy fuels are phased out as hydrogen consumption increases, reflecting an increasing number of FCEBs in the fleet. Fleet energy use is reduced by one-third, from about 0.34 million DGE in 2021 to just under 0.26 million DGE in 2040.

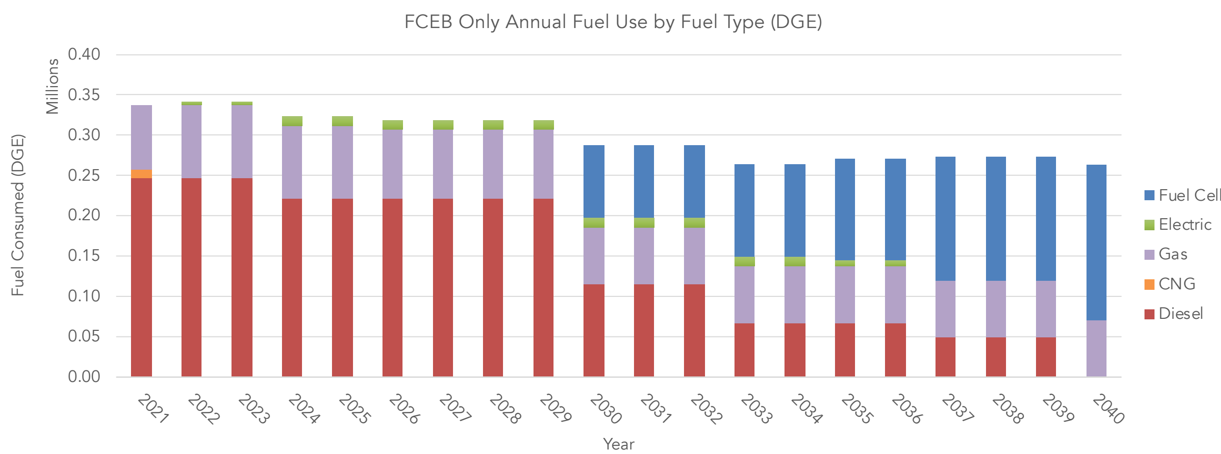



*Figure 32 - Annual Fuel Consumption, FCEB Only*

**Figure 33** shows estimated annual costs for each fuel type based on the quantities consumed, as shown in **Figure 32**. Total estimated fuel costs in 2040, from hydrogen fuel and the gasoline for the remaining ICE cutaways, are approximately $1.6 million, which is double the price of electricity in 2040 in the BEB Only Scenario. This scenario is the most expensive scenario at current market prices, however, when applying sensitivity analysis to hydrogen costs, it does become cost competitive when compared with the cost of electricity in 2040.

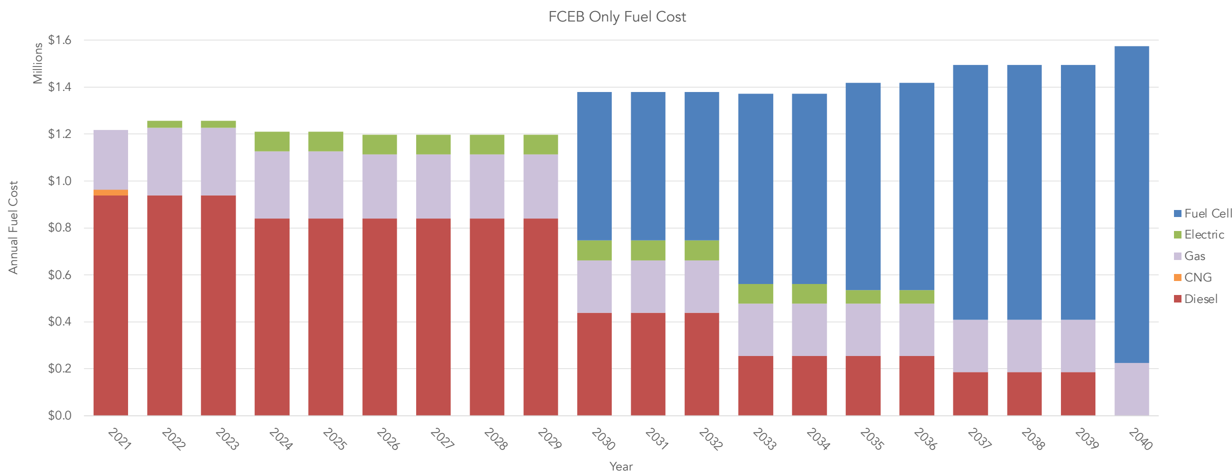



*Figure 33 - Annual Fuel Costs, FCEB Only*

## Fuel Assessment Cost Comparison

The Fuel Assessment includes all fuel costs over the transition for each scenario. **Table 14** shows the combined total costs based on a sensitivity analysis. Note that the sensitivity analysis includes rate increases due to proposed infrastructure upgrades of 3.2% annually.

For electricity and hydrogen, the projected costs per mile are more variable. Hydrogen is the most expensive fuel in the near-term because of its high cost of production. Future technology and policy advancements may reduce the production cost for hydrogen and the resulting price of the fuel. Therefore, the estimate is shown to reflect the potential decrease in hydrogen prices in the future in the FCEB Only scenario. In reverse, electricity prices are likely to rise in the future in California, which is predominantly served by PG&E. BCAG receives electricity from PG&E and will be affected by increases in electricity costs should PG&E decide to bundle costs to upgrade their infrastructure with end user pricing as they have indicated is their intention. The table and graphs below only show the impact of the sensitivity analysis on the BEB Only and FCEB Only scenarios to avoid confounding the impacts of the sensitivity analysis on possible future pricing by mixing the fuels.

*Table 14 – 2040 Fuel Sensitivity Cost, Fuel Assessment*

| Scenario | 2040 Fuel Cost (2021 $) | 2040 Fuel Cost with Sensitivity Analysis Applied | Difference ($) | Difference (%) |
|---|---|---|---|---|
| **1: BEB Only** | $ .808M | $ 1.245M | $ .437M | 54% |
| **3. FCEB Only** | $ 1.575M | $ 1.098M | $ .477M | -30% |

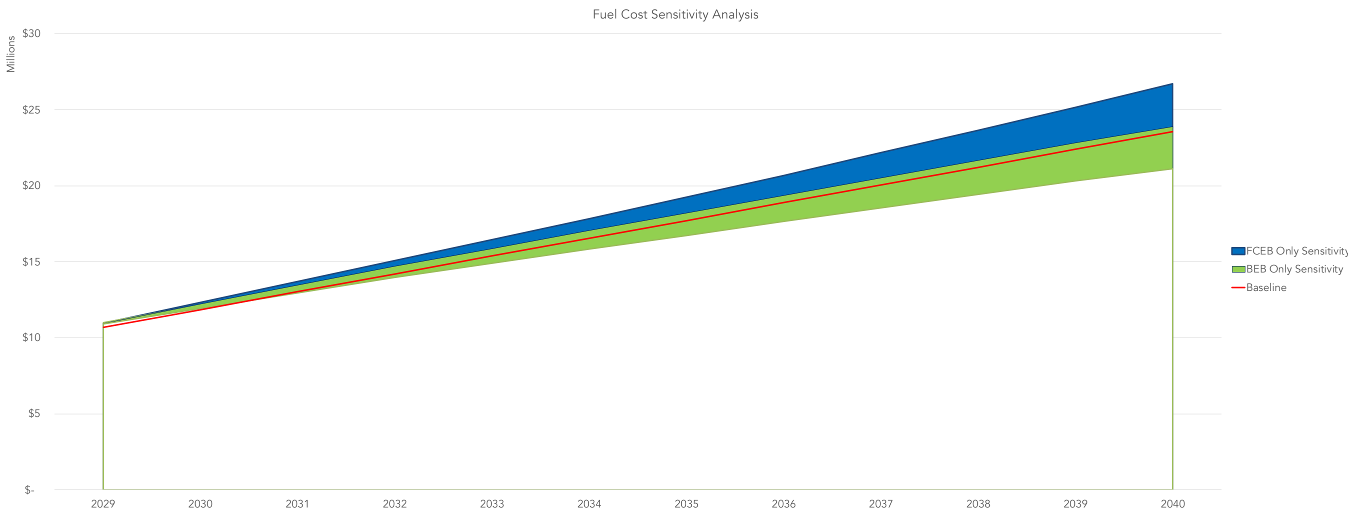



*Figure 34 – Cumulative Fuel Costing Sensitivity Analysis, Hydrogen and Electricity*

# Maintenance Assessment

The Maintenance Assessment examines the changes to fleet maintenance costs for each fleet composition scenario over the transition period. Since ICE and zero-emission vehicles have different maintenance requirements, they generally have different maintenance costs associated with them. For both BEB and FCEB maintenance cost estimates, CTE developed assumptions using real-world data from early adopters of ZEBs and applied them to BCAG's Maintenance Assessment. Taking on a conservative outlook of vehicle performance, CTE also included the cost impact of midlife overhauls (where technicians look for signs of corrosion and install more durable parts) for major components of B-Line's current fleet and FCEBs in the Maintenance Assessment. CTE used BCAG's reported costs for maintenance and average engine and transmission overhaul for the newest models of their existing fleet (consisting of CNG and diesel-powered buses and gasoline-powered cutaways). CTE also included the price of a midlife overhaul for FCEBs that covers the cost of a complete overhaul of the fuel cell system, which, if required, can be significant and may offset savings from traditional maintenance costs. It is worth noting that the cost of a battery replacement for a BEB, and the battery portion of FCEB's midlife maintenance costs, is covered under the battery warranty. This is purchased in the procurement year and is therefore considered a capital cost versus an operational/maintenance cost.

## Cost Assumptions

CTE's maintenance cost assessment includes labor, materials, and midlife overhaul costs. This assessment applied unit maintenance cost per mile by vehicle type with total costs based on average annual vehicle mileage as reported by BCAG. Total costs are based on the following assumptions:

- Maintenance costs for diesel buses and gasoline-powered cutaways are based on data from B-Line's current fleet.
- Maintenance costs for BEBs are based on a 30% reduction of diesel equivalent bus maintenance costs.
    - It is important to keep in mind that maintenance costs are hard to predict. Compared to conventional diesel and gasoline fueled vehicles, BEBs incur different maintenance needs that vary based on manufacturer and operating environment. In addition, a lot of the equipment for BEBs is covered by warranty, so costs in the first few years for maintenance are significantly lower than in the latter half of their service lives.
- Hydrogen maintenance costs were based on OCTA's reported labor and maintenance costs.

- This FCEB maintenance per mile value is based on the costs for the first year of service at OCTA. Therefore, this cost is likely high and will eventually trend downward since this is a first-generation vehicle. Long-term FCEB maintenance costs for US manufactured buses are still to be determined and should be carefully considered as BCAG implements their transition plan.

**Table 15** is a summary of the estimated combined costs for scheduled and unscheduled labor and maintenance for each type of bus explored in this study.

*Table 15 - Labor and Materials Cost Assumptions*

| Vehicle Type | Estimate (Per Mile) | Source |
|---|---|---|
| **40' CNG Bus** | $ 0.49 | BCAG maintenance cost for a 2008 model |
| **30'/35' Diesel Bus** | $ 0.32 | BCAG maintenance cost for a 2017 model |
| **40' Diesel Bus** | $ 0.35 | BCAG maintenance cost for a 2017 model |
| **Gas Cutaway** | $ 0.33 | BCAG maintenance cost for a 2018 model |
| **30'/35' Electric Bus** | $ 0.22 | 30% reduction of maintenance cost for a 30'/35'/40' Diesel Bus |
| **40' Electric Bus** | $ 0.24 | 30% reduction of maintenance cost for a 30'/35'/40' Diesel Bus |
| **30'/35'/40' Fuel Cell Bus** | $ 0.56 | OCTA reported labor and maintenance costs for the first year of service of a first-generation vehicle |
| **Fuel Cell Cutaway** | $ 0.56 | OCTA reported labor and maintenance costs for the first year of service of a first-generation vehicle |

This assessment also estimates the cost impact of midlife overhauls for major components in each type of bus, as summarized in **Table 16.** In a midlife overhaul, technicians look for signs of corrosion and install more durable parts. The costs in **Table 16** are the starting values for midlife overhaul costs. As a reminder, BEB maintenance cost does not include the battery warranty price of $50,000, which is purchased in the year of procurement and covers a single mid-life battery replacement.

*Table 16 - Midlife Overhaul Cost Assumptions*

| Type | Overhaul Scope | Estimate | Source |
|---|---|---|---|
| **Diesel** | Engine/Transmission Overhaul | $56k per bus | BCAG |
| **Cutaway** | Engine/Transmission Overhaul | $10k per cutaway | BCAG |
| **FCEB** | Fuel Cell Overhaul | $40k per bus | Average cost by OEM and fuel cell manufacturer |

## Baseline

The 12-year replacement cycle creates a cyclical pattern in maintenance costs every six years due to midlife overhauls. As a result, expected maintenance costs spike every six years after a large number of buses are purchased, such as in 2036. Since this scenario represents a fleet that stays almost entirely composed of diesel buses and gas cutaways, the peaks consistently repeat every 12 years at the midlife of large purchases. In non-midlife and replacement years, the average annual maintenance cost is approximately $640,000.

**Figure 35** shows the combined labor, materials, and midlife overhaul costs for the Baseline scenario for each year of the transition.

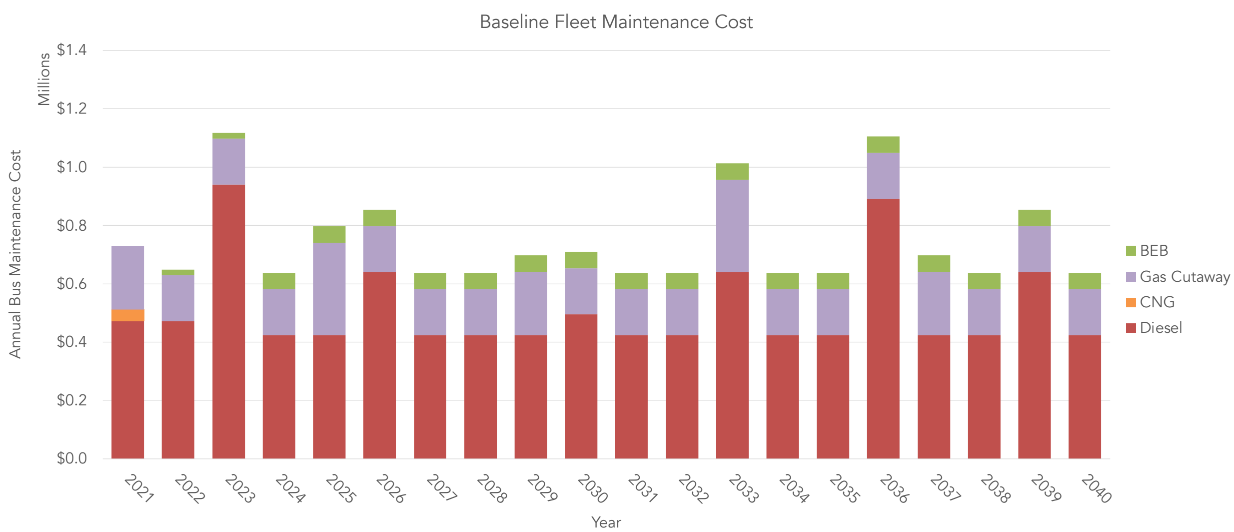



*Figure 35 - Annual Fleet Maintenance Costs, Baseline*

## BEB Only

**Figure 36** shows the combined labor and materials for the BEB Only scenario for each year of the transition. For the BEB Only scenario, the cost of the battery warranty is used to reflect the midlife battery replacement. In the assessment, these warranty costs are incurred at the time of the bus purchase and were included in the capital costs seen in the Fleet Assessment and are therefore not included in the costs shown below. The spikes in expected maintenance costs that would be expected for this scenario to occur in the same years that large bus procurements take place such as in 2030 and in its midlife purchase year of 2036 does not appear as it does for FCEB and diesel purchases.

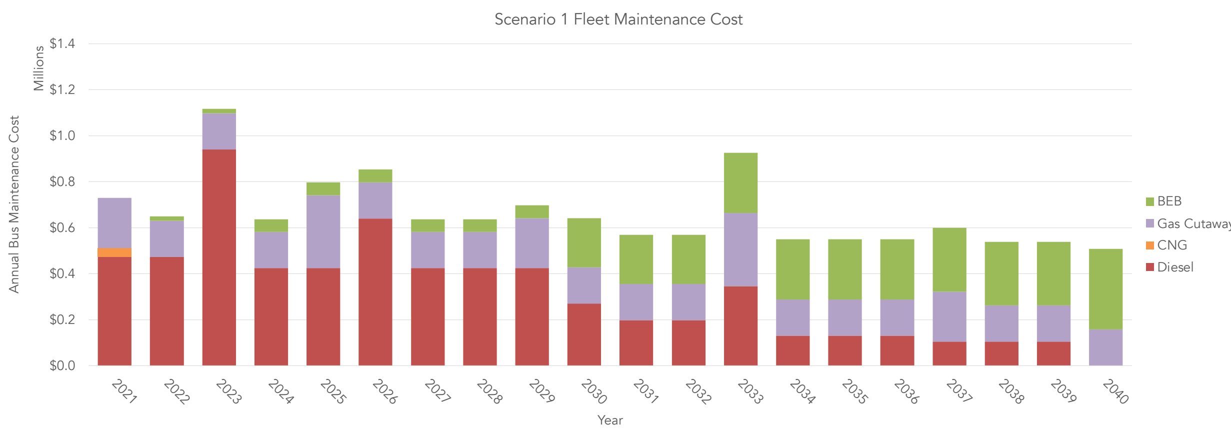



*Figure 36 - Annual Fleet Maintenance Costs, BEB Depot-Only*

## Mixed Fleet – BEB Majority

**Figure 37** shows the combined labor, materials, and midlife overhaul costs for the Mixed Fleet – BEB Majority scenario for each year of the transition. Similar to the above scenario, anticipated midlife battery replacements for ZEBs are covered in the extended battery warranty purchased in the year of purchase and can be seen in the Fleet Assessment. In this scenario, the largest procurement of 8 FCEBs and 4 fuel cell electric cutaways is expected to take place in 2030. As such overhaul costs are incurred in year 2033 when the cutaways are at midlife and 2036 when the FCEBs are at midlife.

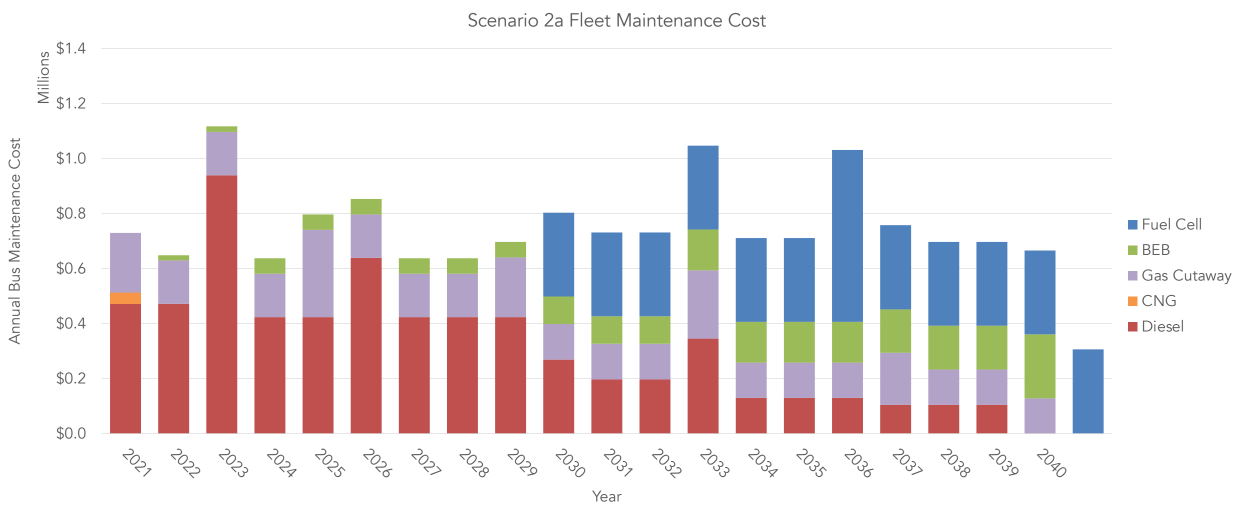



*Figure 37 - Annual Fleet Maintenance Costs, Mixed Fleet – BEB Majority*

## Mixed Fleet – FCEB Majority

**Figure 38** shows the combined labor, materials, and midlife overhaul costs for the Mixed Fleet – FCEB Majority scenario for each year of the transition. The pattern of high-cost years is very similar to the previous scenario with fuel cell electric cutaways incurring high costs in 3033 and FCEBs incurring high costs in 2036 when their respective midlives occur after being purchased in 2030.

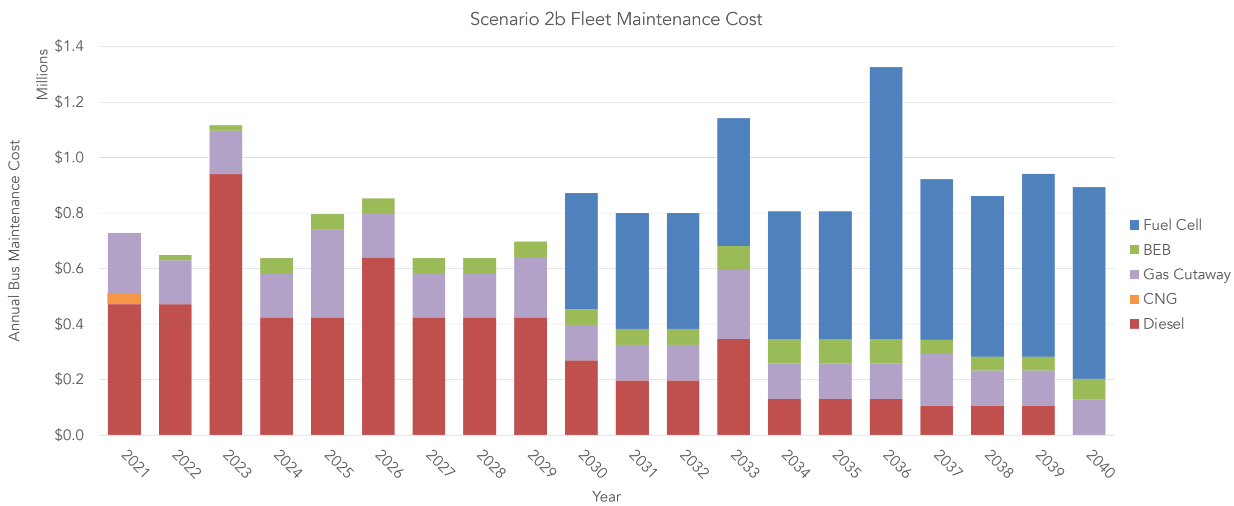



*Figure 38 - Annual Fleet Maintenance Costs, Mixed Fleet - FCEB Majority*

## FCEB Only

**Figure 39** shows the combined labor, materials and midlife overhaul costs for the FCEB Only scenario for each year of the transition. Maintenance costs for fuel cells were calculated using industry-reported maintenance costs per mile and maintenance costs reported by OCTA. The estimated cost for one fuel cell overhaul ($40,000) was based on the average cost for this activity as reported by bus and fuel cell manufacturers. The spike in 2036 is the result of mid-life fuel cell replacement.

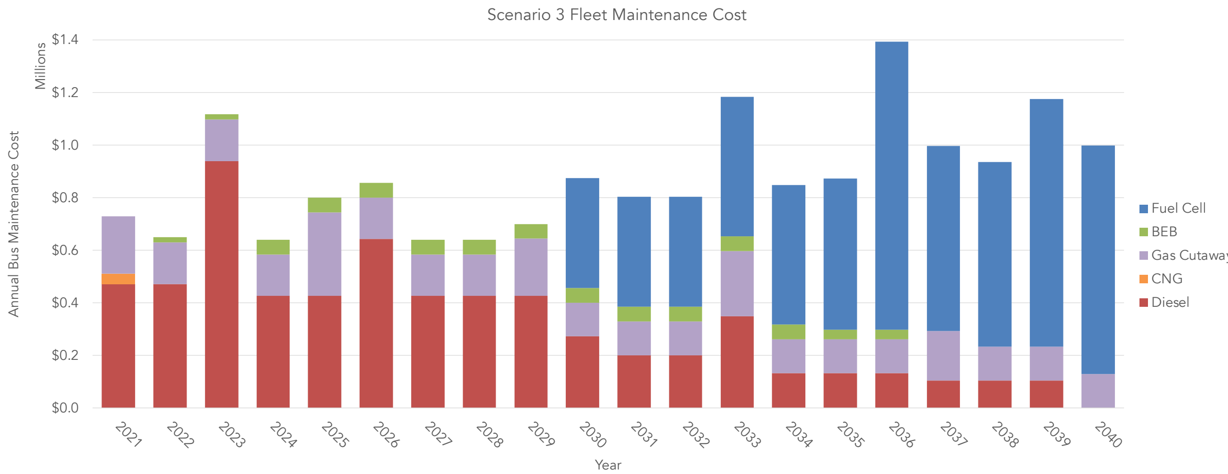



*Figure 39 - Annual Maintenance Costs, FCEB Only*

## Maintenance Assessment Cost Comparison

**Figure 40** shows the cumulative maintenance costs for each scenario. CTE's Maintenance Assessment projects that by 2040, the FCEB Only scenario will incur the highest cumulative maintenance cost ($18M) while the BEB Depot Only scenario will incur the least amount of maintenance cost ($13M) over the transition period. The cumulative maintenance cost for the Mixed Fleet – BEB Majority Scenario is on par with the Baseline scenario. The cumulative maintenance cost for the Mixed Fleet – FCEB Majority Scenario is only slightly lower than the FCEB Only Scenario at $17M.

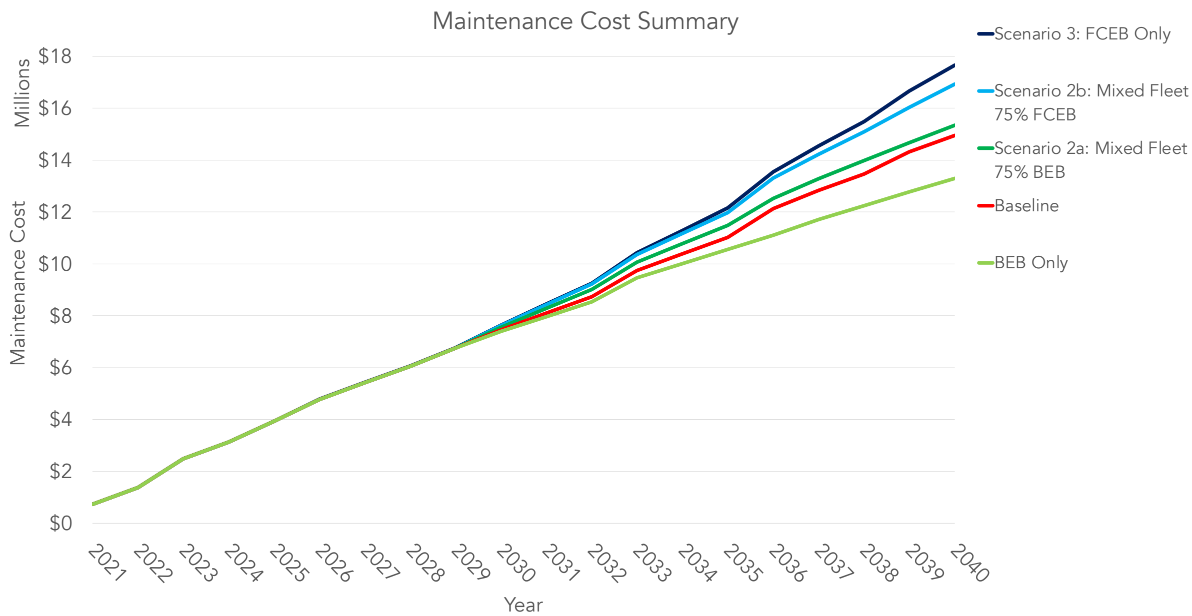



*Figure 40 - Total Costs, Maintenance Assessment*

**Figure 41** shows the total maintenance costs for each scenario at the end of the 20-year transition period. The total maintenance cost for the FCEB Only scenario is shown to be the costliest because of its because of its higher average cost for fuel cell as well as higher estimated maintenance cost per mile. Overall, the zero-emission scenarios' maintenance costs are comparable with the Baseline scenario, all of which are within $3 million of the baseline scenario.

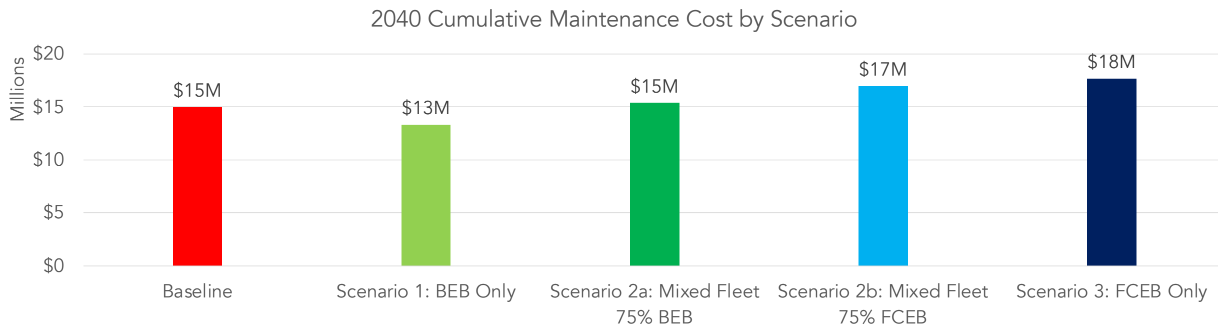



*Figure 41 - Cumulative Maintenance Cost by Scenario*

# Facilities Assessment

The Facilities Assessment determines the scale of fueling infrastructure (charging stations for BEBs and hydrogen fueling stations for FCEBs) that is needed to meet the projected energy use for each scenario. It is informed by the Fleet and Fuel Assessments. Facilities costs are estimated based on the assessed infrastructure requirements for the given fleet and the selected fueling technology. The information in this section is organized according to the fueling technology explored in this transition plan: depot-charging and hydrogen storage and fueling station. Diesel and gas fueling station build and installation costs are not included in this assessment as BCAG has already invested in the fueling infrastructure necessary to support their current fleet.

## Assessment Conducted in Collaboration with Stantec

CTE and Stantec developed estimates for components of the BEB infrastructure. In the near term, BCAG will procure six BEBs for their current fleet; however, their existing infrastructure does not currently include charging infrastructure. Therefore, all scenarios, including the baseline scenario, capture costs for the design, equipment, site construction, and installing of chargers. The capacity of the chargers and amount of equipment will vary depending on the BEB fleet size.

Stantec prepared conceptual layouts for the BEB and FCEB Scenarios and Mixed Fleet Scenarios, which are provided in **Appendices – BCAG Depot Site Plans.** When BCAG begins its ZEB transition in 2029, the Butte Regional Operations Center (BROC) depot will require modifications or re-purposing. Stantec also supplied a report including the power requirements, equipment and raceway routing, and phasing to convert the BROC depot to an electric charging and hydrogen fueling depot for the BEB Only, FCEB Only, and the Mixed Fleet: BEB and FCEB scenarios.

## Current System Description

The BROC is served electrically by PG&E through a utility owned transformer located just north of the main bus maintenance building, adjacent to Aztec Drive. The existing service provides 1,000 kVA (1,200 Amp) of capacity to the main service switchboard ("SSB") located next to the transformer. Also adjacent to the transformer are two standby diesel generators "EGU-1" (750 kVA) and "EGU-2" (250 kVA). Fuel for the generators is stored in a nearby underground storage tank. There is reportedly enough onsite fuel to power the entire Operation Center current operations for more than one week.

The power output from switchboard SSB and the standby engines is fed into an automatic transfer switch (ATS). In the event of a utility power interruption, the ATS connects the site electrical loads to the standby engines and disconnects the feed from the SSB. The ATS is located next to the SSB near the main transformer and the standby engines.

Power from the ATS is fed to the main switchboard (MSB). Feeder breakers in MSB feed 480V electrical distribution panels and stepdown transformers in the Operations/Admin, Maintenance, and BCAG Buildings as well as the wash area.

Power from a 300 kVA photovoltaic generation system mounted on the parking area canopies is fed to the SSB where it can be used by the site operations. Excess power is exported to PG&E under a Net Energy Metering arrangement. Power demands in excess of the photovoltaic (PV) production is imported from PG&E.

The Operations Center electrical system is in excellent condition and was installed as part of the 2015 site development. The equipment has an estimated remaining service life in excess of 20 years.

## System Capacities

The primary PG&E service feeding the facility is 1,000 kVA (900 kW), and the SSB is rated at 1,200 Amps. The eight 480-208/120 V transformers served by the SSB have a total capacity of 382 kVA. Actual site demand data was not available at the time of this writing but, based on the known connected loads, is estimated that the current coincident peak electrical demand is approximately 450 kVA (400 kW). Prior to the conversion of the bus fleet to BEBs or FCEBs, there are no expectations of significant demand growth on the site.

The existing standby generators have a combined capacity of 1,000 kVA and can fully replace the available utility power service.

## Description of Depot-Charging Infrastructure Considered

Compared to smaller pilot deployments, scaling to a fleetwide BEB deployment requires substantial infrastructure upgrades and a significantly different approach to charging. With small BEB pilot deployments, charging requirements are met relatively easily with a handful of plug-in pedestal chargers and minimal infrastructure investment. For fleetwide BEB transitions, the preferred approach is to use overhead pantograph or reel dispensers attached to gantries installed above bus parking lanes to minimize the impact on available parking and reduce the potential for bus and equipment collisions. Stantec reviewed the structural calculations for the solar canopies and determined that they do not have structural capacity to accommodate the addition of overhead dispensers. Stantec also determined that retrofitting them to do so may be cost prohibitive.

The recommendation is that the underground duct banks be installed from the charger island to each dispenser that is mounted on the ground. BCAG will charge the buses using plug-in dispensers. The duct banks have adequate conduit capacity to support all of the anticipated BEB chargers, data communication, as well as spare conduit to provide paths for future needs. Installing the underground infrastructure at the outset will minimize operational disruptions in the future.

In addition to the installation of charging stations, improvements to existing electrical infrastructure, such as upgrades to switchgear or service connections, are required to support the deployment of BEBs. Planning and design work, including development of detailed electrical and construction drawings required for permitting, is necessary once specific charging equipment has been selected. To define the installation timeline and costs for charging equipment for each scenario, the scope of work is broken into three key project types:

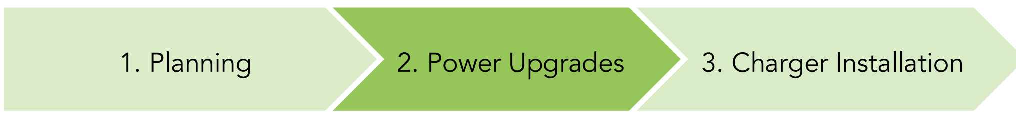

These projects are typically sized and scheduled to meet near-term charging requirements rather than immediately building out all necessary infrastructure for a full fleet transition.

The following key assumptions were applied in BCAG's Facilities Assessment for BEB deployments:

- One dual cable BEB charging dispensers with power connections for every bus;
- One BEB charging cabinet and associated feeders per two dual cable BEB charging dispenser;
- New 480V panel or switchgear. Feeder from 480V panel/switchgear to charging cabinets rated at 20A per cabinet;
- Charging cabinets to dual dispenser via vault C is assumed at 350A per dispenser;
- Pairing and ethernet connections is assumed for dual dispensers;
- Two buses per 150 kW charger;
- Two charge windows (meaning that no more than half of the fleet will ever be charging at a given time);
- Off-peak, overnight charging with automated charge management software to help reduce demand on the grid;
- Dispenser capacity to serve up to 80% of the fleet at a time;
- No movement of buses overnight.


***Infrastructure Planning Project***

Charging infrastructure for a large BEB fleet has significant power and space requirements. Large-scale fleets may require bus depot redesigns to accommodate the additional equipment. Planning is an essential step in understanding the best solutions to keep electricity costs down while meeting service requirements. The estimated planning cost for the infrastructure transition at the BROC depot is $200,000, which is scheduled to occur in the year prior to installation of the first charging infrastructure project.




***Power Upgrade Projects***

Power upgrade projects include construction of transformer foundations and installation of transformers. It is assumed that transformers will be modular and that incremental power requirements will be met over time. These costs are variable by scenario, but all Power Upgrade project costs assume that PG&E will install the transformer for BCAG's service, as well as several additional costs as seen in **Table 17**.

*Table 17 - Depot Power Upgrade Cost Assumptions, BEB Only Scenario*

| Transformer/Switchback Pad | Cost | Unit |
|---|---|---|
| **Transformer** | PG&E Cost (Not Passed to Agency) | |
| **Electrical Upgrades on Site** | Dependent on Scenario | Total |
| **General Requirements** | 15% | per project costs |
| **Design Contingency** | 20% | on project costs |
| **Market Factor** | 7% | on project costs |
| **Bonds** | 2% | on project costs and contingency |
| **Insurance** | 6.5% | on project costs and contingency |

Power upgrades are consolidated to occur in selected years, in accordance with the required demand.


***Charger Installation Projects***

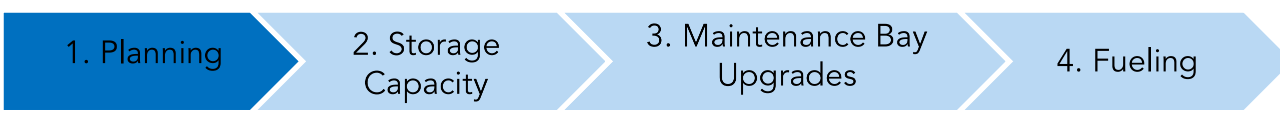
Charging projects include purchase and installation of 150 kW power cabinets with two dispensers each. Since there are two dispensers per charger, every two buses will require one charger. **Table 18** provides the costs assumed for charger installs.

*Table 18 - Charger Project Cost Assumptions*

| Electric Charging Station Costs | Unit Cost |
|---|---|
| BEB Charging Cabinet with 2 Dispensers | $ 389,000 |

## Description of Hydrogen Fueling Infrastructure Considered

To define the timeline and costs to build hydrogen fueling infrastructure for each scenario, CTE breaks the scope of work into four key project types: (1) planning, (2) structural, (3) maintenance bay upgrades, and (4) fueling. Projects are sized and scheduled to meet near-term fueling requirements.




***Infrastructure Planning Project***

Building hydrogen infrastructure requires planning at each depot. The total projected cost of planning for BCAG's project is $200,000.


***Storage Capacity***

The total cost for permanent hydrogen fueling infrastructure project is approximately $5.4 million over the transition period. The first planning project is scheduled in 2029, with installation in 2030, which will add the initial 50-bus capacity tank.

*Table 19 –Hydrogen Storage Infrastructure Elements*

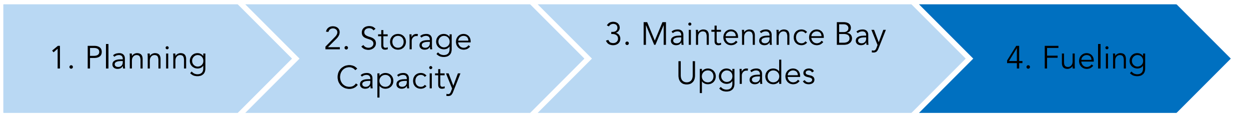
| Infrastructure Element | Cost | Unit |
|---|---|---|
| **Hydrogen Storage** | $500,000 | Total |
| **General Requirements** | 15% | per project costs |
| **Design Contingency** | 20% | on project costs |
| **Market Factor** | 7% | on project costs |
| **Bonds** | 2% | on project costs and contingency |
| **Insurance** | 6.5% | on project costs and contingency |


***Maintenance Bay Upgrade Projects***

Maintenance bays at each depot require hydrogen detection and exhaust equipment to ensure safety. A total of 6 maintenance bays will require upgrades. CTE assumes about $58,000 per bay for the required upgrades. This cost comes from the requirement of additional ventilation systems. For maintenance bay upgrade projects, CTE estimates a total cost of $350,000 for BCAG in 2030.

*Table 20 – Maintenance Bay Upgrade Estimates*

| Infrastructure Element | Cost | Unit |
|---|---|---|
| **Hydrogen Safety Upgrades** | $350,000 | Total |
| **General Requirements** | 15% | per project costs |
| **Design Contingency** | 20% | on project costs |
| **Market Factor** | 7% | on project costs |
| **Bonds** | 2% | on project costs and contingency |
| **Insurance** | 6.5% | on project costs and contingency |




For hydrogen fueling equipment, it is economical to build a station in a single project with all necessary mechanical and fueling components. Storage tanks can be added in a modular fashion as demand increases, separately from other fueling components if needed. What is referred to as "fueling projects" include:

1. Dispenser(s);
2. All mechanical process equipment and hydrogen wetted components;
3. Design, engineering, and permitting;
4. Construction;
5. Demolition of existing pavement, and excavation;
6. Installation of new equipment foundations;
7. All electrical conduit, conductors, and termination;
8. Emergency shut down and notification system;
9. Mechanical installation;
10. Electrical utilities and switchgear.

The number of dispensers varies between the BEB Majority Mixed Fleet and the FCEB Only and FCEB Majority Mixed Fleet Scenarios, so the cost for dispensers is variable between scenarios.

*Table 21 – Hydrogen Fueling Element Cost Estimates*

| Infrastructure Element | Cost | Unit |
|---|---|---|
| **Dispensers** | Dependent on Scenario | Total |
| **General Requirements** | 15% | per project costs |
| **Design Contingency** | 20% | on project costs |
| **Market Factor** | 7% | on project costs |
| **Bonds** | 2% | on project costs and contingency |
| **Insurance** | 6.5% | on project costs and contingency |

## Scenario 1: BEB Depot-Only Charging Infrastructure Projects

BEB Charging Infrastructure Cost Summary

The estimated total infrastructure costs for the BEB Only scenario is approximately $8.1 million. **Figure 42** shows the cumulative total cost breakdown. This total cost includes all power upgrade projects, all charger and dispenser installations, all planning projects, design engineering costs and the added contingencies on all costs.

- **INFRASTRUCTURE PLANNING.** Building charging infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **DISPENSERS AND CHARGERS.** A total of 32 dispensers will be needed at BCAG's depot in to accommodate 32 BEBs in the fleet. In total, this scenario requires 16 chargers, assuming two dispensers per charger. Charging projects include purchase and installation of 150 kW chargers and dispensers. These projects total $6.1 million for BCAG by 2040.
- **MW SERVICE UPGRADE.** BCAG will need to add an estimated 3 MW of capacity to its system by 2040 to accommodate charging for 32 BEBs. To meet the growing demand of electricity, the BROC depot will need to upgrade its system to at least 1 MW of capacity by 2022 and up to 2 MW of capacity by 2033. These upgrades are estimated to cost around $1.8 million over the transition period.
- **GENERAL CONDITIONS / GENERAL REQUIREMENTS:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **CONTINGENCY.** A 20% contingency is added on all project costs.
- **MARKET FACTOR.** 7% is added on all project costs, conditions, and contingency.
- **BONDS AND INSURANCE.** 2% is added on all project costs, conditions, contingency, and market factors.
- **CONTRACTOR'S FEE.** 6.5% is added on all project costs, conditions, contingency, and market factors.

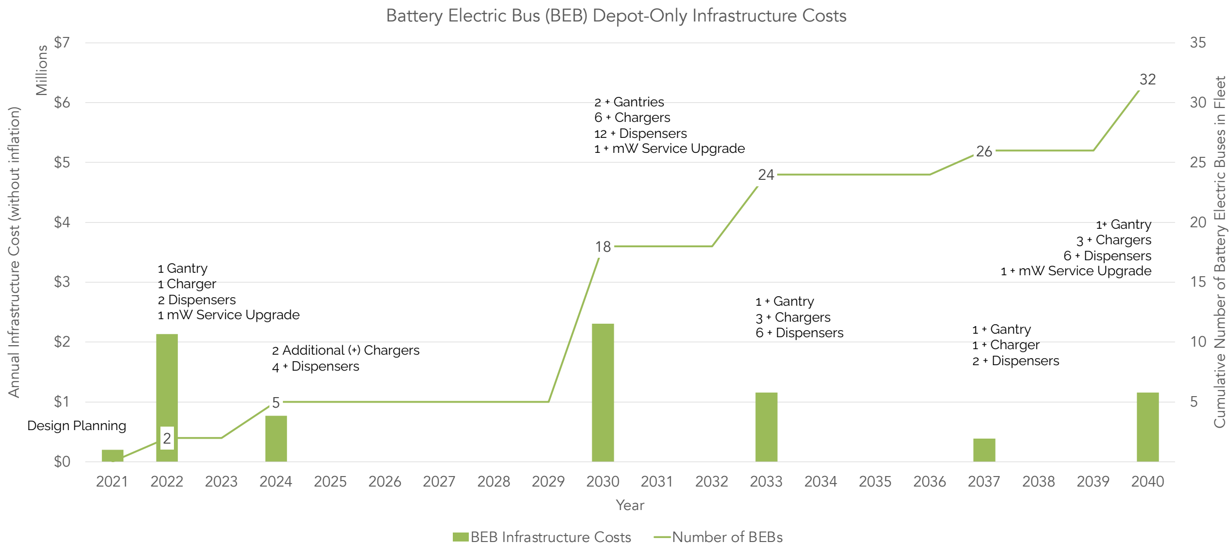



*Figure 42 - Infrastructure Costs, BEB Only Scenario*

## Scenario 2a: Mixed Fleet – BEB Majority Infrastructure Cost Summary

In the Mixed Fleet: BEB Majority scenario, charging infrastructure is required to service a total of 24 BEBs and additional hydrogen fueling infrastructure for eight FCEBs and four fuel cell electric cutaways to support a completely zero-emission bus fleet by 2040. Because there are separate costs associated with each type of ZEB technology, the facilities assessment for this scenario is broken down by each fuel type. The total cost of this scenario would be slightly more than $11.2M.

### BEB Charging Infrastructure Cost Summary

The estimated total BEB infrastructure costs for the Mixed Fleet scenario are approximately $6.7 million (see **Figure 43**). The estimated infrastructure costs for the BEB technology & infrastructure includes the following costs:

- **Infrastructure planning.** Building charging infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **Dispensers and Chargers.** A total of 24 dispensers will be needed at BCAG's depot to accommodate 24 BEBs in the fleet. In total, this scenario would require 12 chargers since we assumed two dispensers per chargers. Charging projects include purchase and installation of 150 kW chargers and dispensers. This would come to $4.6 million for BCAG by 2040.

- **MW Service Upgrade.** BCAG will need to add an estimated additional 2 MW of capacity to its system by 2040 to accommodate charging for 24 BEBs. To meet the growing demand for electricity, the BROC depot will need to upgrade its system to at least 1 MW of capacity by 2022 and up to 2 MW of capacity by 2033. This is estimated to cost around $1.9 million over the transition period.
- **General Conditions / General Requirements:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **Contingency.** A 20% contingency is added on all project costs.
- **Market Factor.** 7% is added on all project costs, conditions, and contingency.
- **Bonds and Insurance.** 2% is added on all project costs, conditions, contingency, and market factors.
- **Contractor's Fee.** 6.5% is added on all project costs, conditions, contingency, and market factors.

FCEB Fueling Infrastructure Cost Summary

In addition to BEB charging, hydrogen fueling is required to support the Mixed Fleet: BEB Majority Scenario. Infrastructure is built out over time as necessary to support FCEB deployment. **Figure 43** shows the estimated infrastructure costs for the FCEB technology, which includes the following costs and reaches a sum of $4.6 million:

- **Infrastructure planning.** Building hydrogen infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **Storage Capacity Projects.** The total cost for storage capacity projects at BCAG is approximately $500,000 over the transition period.
- **Maintenance bay upgrades.** Maintenance bay upgrades are required to make the bays compliant with hydrogen safety regulations. At BCAG, CTE integrated Stantec's estimated cost for each bay upgrade at $58,000. This cost estimate stems from the requirement of additional ventilation systems necessary for hydrogen detection. With six maintenance bay and gas detection upgrades, the total cost for hydrogen infrastructure in this scenario is estimated at $1.2 million.
- **H2 Fueling infrastructure.** The number of dispensers is a variable that can be scaled to fit the number of vehicles that need to be fueled. A single dispenser is capable of fueling a single bus every 15 minutes. Therefore, having two dispensers

will allow vehicles to be fueled twice as fast as a single dispenser. Because this scenario requires fueling only 12 vehicles, which could be fueled in three hours with a single dispenser and since this three-hour fueling window is acceptable to BCAG, a single dispenser and associated fueling elements was assumed, which is estimated to cost $1.9 million.

- **GENERAL CONDITIONS / GENERAL REQUIREMENTS:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **CONTINGENCY.** A 20% contingency is added on all project costs.
- **MARKET FACTOR.** 7% is added on all project costs, conditions, and contingency.
- **BONDS AND INSURANCE.** 2% is added on all project costs, conditions, contingency, and market factors.
- **CONTRACTOR'S FEE.** 6.5% is added on all project costs, conditions, contingency, and market factors.

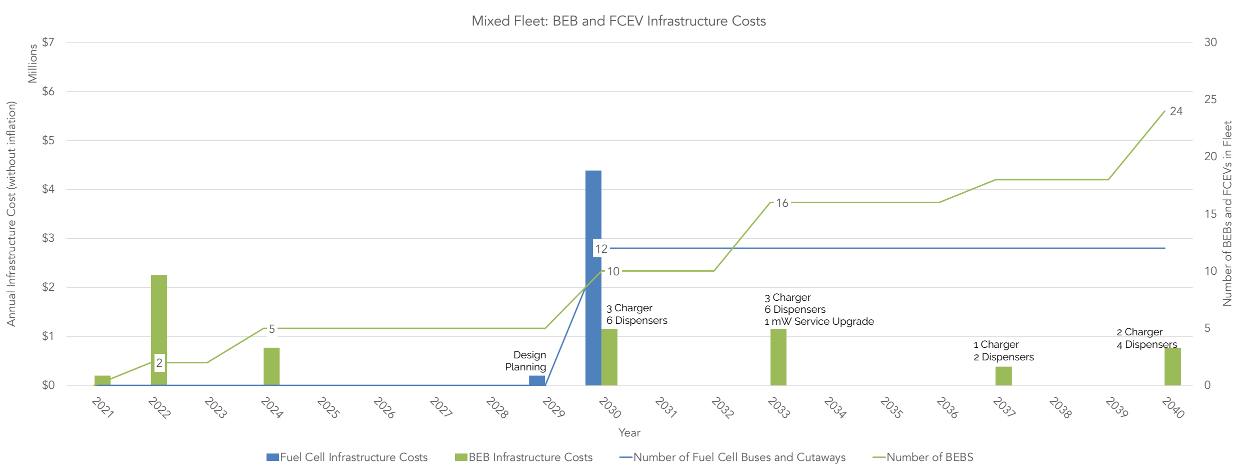



*Figure 43 - Infrastructure Costs, Mixed Fleet - BEB Majority Charging Scenario*

## Scenario 2b: Mixed Fleet – FCEB Majority Infrastructure Cost Summary

In the Mixed Fleet: FCEB Majority scenario, charging infrastructure is required to service a total of eight BEBs, and hydrogen fueling infrastructure is required to fuel 24 FCEBs and four fuel cell electric cutaways to support a completely zero-emission bus fleet by 2040. Because there are separate costs associated with each type of ZEB technology, the facilities assessment for this scenario is broken down by each bus type beginning with BEB. The total infrastructure cost for this scenario is estimated at $8.4 million.

### BEB Charging Infrastructure Cost Summary

The estimated total BEB infrastructure costs for the Mixed Fleet scenario are approximately $3.0 million (see **Figure 44**). The estimated infrastructure costs for the BEB technology & infrastructure includes the following costs:

- **INFRASTRUCTURE PLANNING.** Building charging infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **DISPENSERS AND CHARGERS.** A total of eight dispensers will be needed at BCAG's depot in this scenario, to accommodate eight BEBs in the fleet. In total, this scenario would require four chargers, assuming two dispensers per chargers. Charging projects include purchase and installation of 150 kW chargers and dispensers. This would come to $1.6 million for BCAG by 2040.
- **MW SERVICE UPGRADE.** BCAG will need to add an estimated additional 1 MW of capacity to its system by 2040 to accommodate charging for eight BEBs. To meet the growing demand of electricity, the BROC depot will need to upgrade its system to at least 1 MW of capacity by 2022. This is estimated to cost $1.3 million.
- **GENERAL CONDITIONS / GENERAL REQUIREMENTS:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **CONTINGENCY.** A 20% contingency is added on all project costs.
- **MARKET FACTOR.** 7% is added on all project costs, conditions, and contingency.
- **BONDS AND INSURANCE.** 2% is added on all project costs, conditions, contingency, and market factors.
- **CONTRACTOR'S FEE.** 6.5% is added on all project costs, conditions, contingency, and market factors.

### FCEB Fueling Infrastructure Cost Summary

In addition to BEB charging, hydrogen fueling is required to support the Mixed Fleet: FCEB Majority Scenario. Infrastructure is built out over time as necessary to support FCEB deployment. **Figure 44** shows the estimated infrastructure costs for the FCEB technology, which includes the following costs and reaches a sum of $5.4 million:

- **INFRASTRUCTURE PLANNING.** Building hydrogen infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.

- **STORAGE CAPACITY PROJECTS.** The total cost for storage capacity projects at BCAG is approximately $500,000 over the transition period.
- **MAINTENANCE BAY UPGRADES.** Maintenance bay upgrades are required to make the bays compliant with hydrogen safety regulations. At BCAG, CTE integrated Stantec's estimated cost for each bay upgrade at $200,000. This cost estimate stems from the requirement of additional ventilation systems necessary for hydrogen detection. With 6 maintenance bay and gas detection upgrades, the total cost for hydrogen infrastructure in this scenario is estimated at $1.2 million.
- **H2 FUELING INFRASTRUCTURE.** The number of dispensers present on the station is a variable that can allow hydrogen fueling equipment to be scaled to fit the number of vehicles that need to be fueled. A single dispenser is capable of fueling a single bus every 15 minutes. Therefore, having two dispensers will allow vehicles to be fueled twice as fast as a single dispenser. Since this scenario requires fueling 28 vehicles, which would take 7 hours with a single dispenser, two dispensers and associated fueling elements was assumed, which is estimated to cost $2.4 million.
- **GENERAL CONDITIONS / GENERAL REQUIREMENTS:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **CONTINGENCY.** A 20% contingency is added on all project costs.
- **MARKET FACTOR.** 7% is added on all project costs, conditions, and contingency.
- **BONDS AND INSURANCE.** 2% is added on all project costs, conditions, contingency, and market factors.
- **CONTRACTOR'S FEE.** 6.5% is added on all project costs, conditions, contingency, and market factors.

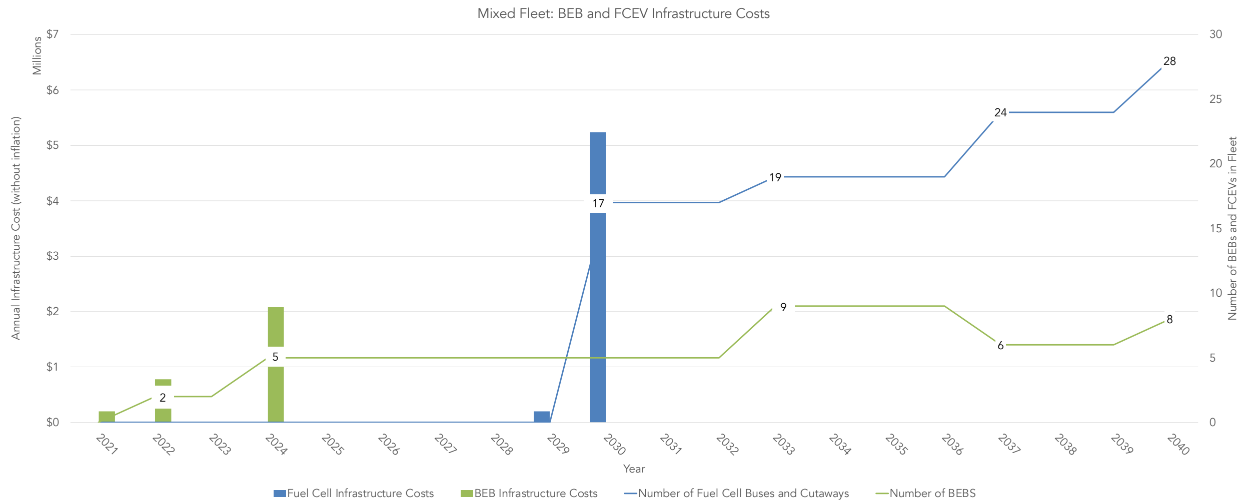



*Figure 44 - Infrastructure Costs, Mixed Fleet - FCEB Majority Charging Scenario*

## Scenario 3: FCEB Only

The FCEB Only scenario assumes a fuel cell bus fleet and four fuel cell cutaways. As in the case of the Baseline scenario, the five known BEB procurements will require electric charging infrastructure. Therefore, while this scenario plans for a full transition to hydrogen fueling, electric depot charging infrastructure, equipment, and installation are considered. In the FCEB Only scenario, BCAG will have procured 32 FCEBs and 4 fuel cell cutaways by 2040. The total infrastructure cost for this scenario would be slightly over $8.0 million.

### BEB Charging Infrastructure Cost Summary

The estimated total BEB infrastructure costs for the Mixed Fleet scenario are approximately $2.7 million (see **Figure 45**). The estimated infrastructure costs for the BEB technology & infrastructure includes the following costs:

- **INFRASTRUCTURE PLANNING.** Building charging infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **DISPENSERS AND CHARGERS.** A total of six dispensers will be needed at BCAG's depot in this scenario, to accommodate 5 BEBs in the fleet that. In total, this scenario would require 3 chargers since we assumed two dispensers per chargers. Charging projects include purchase and installation of 150 kW chargers and dispensers. This would come to $1.6 million for BCAG by 2040.

- **MW Service Upgrade.** BCAG will need to add an estimated additional 2 MW of capacity to its system by 2040 to accommodate charging for 24 BEBs. To meet the growing demand of electricity, the BROC depot will need to upgrade its system to at least 1 mW of capacity by 2022. This cost is estimated at $1.3M.
- **General Conditions / General Requirements:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **Contingency.** A 20% contingency is added on all project costs.
- **Market Factor.** 7% is added on all project costs, conditions, and contingency.
- **Bonds and Insurance.** 2% is added on all project costs, conditions, contingency, and market factors.
- **Contractor's Fee.** 6.5% is added on all project costs, conditions, contingency, and market factors.

FCEB Fueling Infrastructure Cost Summary

In addition to BEB charging, hydrogen fueling is required to support the FCEB Only Scenario. Infrastructure is built out over time as necessary to support FCEB deployment. **Figure 45** shows the estimated infrastructure costs for the FCEB technology, which includes the following costs and reaches a sum of $5.4 million:

- **Infrastructure planning.** Building hydrogen infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 occurs only once per depot. The total cost of planning projects for BCAG's single depot is approximately $200,000.
- **Storage Capacity Projects.** The total cost for storage capacity projects at BCAG is approximately $500,000 over the transition period.
- **Maintenance bay upgrades.** Maintenance bay upgrades are required to make the bays compliant with hydrogen safety regulations. At BCAG, CTE integrated Stantec's estimated cost for each bay upgrade at $58,000. This cost estimate stems from the requirement of additional ventilation systems necessary for hydrogen detection. With 6 maintenance bay and gas detection upgrades, the total cost for hydrogen infrastructure in this scenario is estimated at $1.2M.
- **H2 Fueling infrastructure.** The number of dispensers present on the station is a variable that can allow hydrogen fueling equipment to be scaled to fit the number of vehicles that need to be fueled. A single dispenser is capable of fueling a single bus every 15 minutes. Therefore, having two dispensers will allow vehicles to be fueled

twice as fast as a single dispenser. Since this scenario requires fueling 32 vehicles, which would take 8 hours with a single dispenser, two dispensers and associated fueling elements was assumed, which is estimated to cost $2.4 million.

- **General Conditions / General Requirements:** A 15% General Conditions and Requirements cost was applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **Contingency.** A 20% contingency is added on all project costs.
- **Market Factor.** 7% is added on all project costs, conditions, and contingency.
- **Bonds and Insurance.** 2% is added on all project costs, conditions, contingency, and market factors.
- **Contractor's Fee.** 6.5% is added on all project costs, conditions, contingency, and market factors.

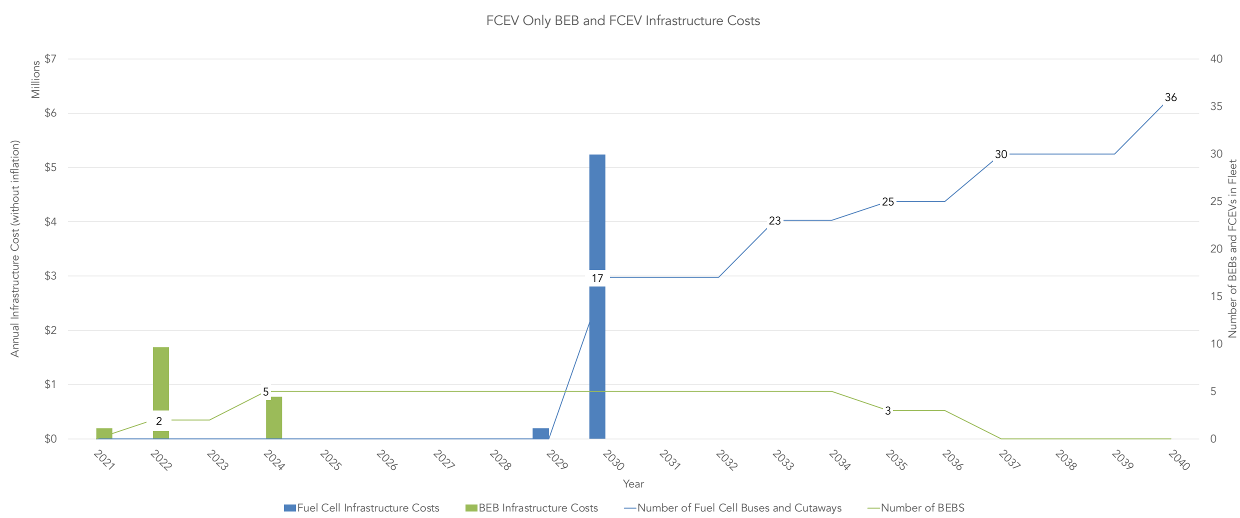



*Figure 45 - Infrastructure Costs, FCEB Only Scenario*

## Facilities Assessment Cost Comparison

The Facilities Assessment includes all infrastructure-related costs over the transition for each scenario. **Figure 46** shows the cumulative infrastructure costs for each scenario.

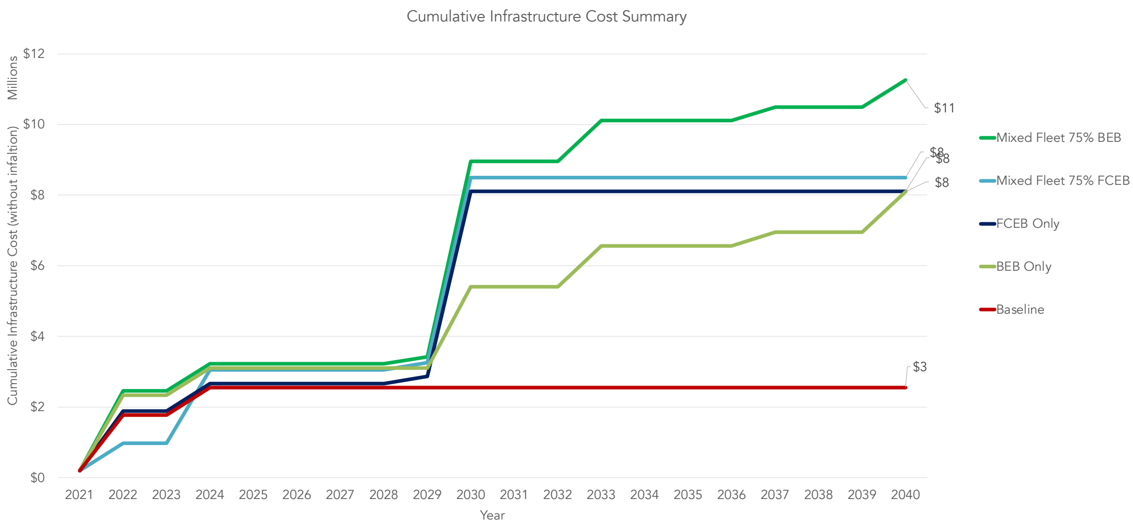



*Figure 46 - Total Cumulative Costs, Facilities Assessment*

# Redundancy, Resilience, and Emergency Response Assessment

The Redundancy, Resilience, and Emergency Response (3R) Assessment investigates the new risks to an agency's ability to provide service during power outages or fuel disruptions and the ability to support required emergency response activities, such as community evacuation with a full ZEB fleet. The project team applied a risk assessment methodology to evaluate various adaptation measures that reduce risks from identified threats under each transition scenario. The effectiveness of adaptation measures is informed by factors such as cost, risk reduction capabilities, a transit agency's risk tolerances, facility constraints, and environmental impacts.

BCAG's primary concerns are addressing ZEB fleet operation in the event of a fuel interruption (i.e., power outage or hydrogen fuel delivery disruption) and planning for evacuation support. BCAG has previously been impacted by severe wildfires, which required community evacuation, and may also put BCAG at risk from planned power outages. It is expected that severe wildfires and flooding events will become more likely and more extreme in the future due to climate change impacts.

B-Line provides community evacuation and re-population support during disaster response, as directed by the Butte County Sheriff. A large evacuation effort would likely require 75% of fixed route vehicles to be staged around the service area and available to evacuate residents for 24-72 hours, and a moderate evacuation effort would require about 25-50% of the fixed route vehicles to be staged and available for 24 hours. During any evacuation effort, some reduced service may be provided in the community with whatever vehicles are available. BCAG expects that all re-population efforts can be accomplished with cutaway vehicles. One round trip for evacuation support could be up to 50 miles, taking about 90 minutes, with about 75% of the trip on the highway. The various ZEB transition scenarios will require different fueling and deployment strategies to meet the first responder needs during disaster response. BCAG will coordinate with the County Sherriff's department and other local emergency response agencies to review the fleet's capabilities and plan for supporting community evacuation.

## 3R Methodology

Risks are calculated using the following formula:

$$Risk\ Score = Threat\ Likelihood\ \times\ Vulnerability\ \times\ Consequences$$

***Threat likelihood*** is the probability of a threat occurring in a given year. Evaluated from Low to Very High, with a maximum value of 1. CTE worked with BCAG to assess the likelihood of each defined threat, utilizing information on past disasters in B-Line's service area, climate data trends, and the experiences of other transit agencies deploying ZEBs.

***Vulnerability*** is the probability that a transit agency will experience consequences if a threat occurs, based on internal capabilities to prepare for, respond to, and recover from threats. Evaluated from Low to Very High, with a maximum value of 1. CTE collected information on BCAG's existing internal capabilities, and evaluated potential improvements to those capabilities from the implementation of adaptation options.

***Consequences*** are the level of impacts that a transit agency would experience if a threat occurs. Evaluated from Low to Very High within different categories, with a maximum value of 4. The Consequences Matrix used in this 3R Assessment is shown in **Table 22**. CTE reviewed the matrix with BCAG and customized the categories, category weightings, and definitions of severity levels to accurately reflect BCAG's tolerances for different types of impacts or consequences.

*Table 22 - 3R Consequences Matrix*

| Consequences Matrix | | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Category Definition** | **Category Weight** | **Low** | **Medium** | **High** | **Very High** |
| **Regional Economic and Customer Impacts** | Impacts to ridership and the regional economy from missed or modified service. | **30%** | < 1 day of impacts to ridership and regional economic impacts | 1 day of impacts to ridership and regional economic impacts | 1 day < duration of impacts < 1 week to ridership and regional economic impacts | > 1 week of service impacts to ridership and regional economic impacts |
| **Staffing Impacts** | Impacts to staff due to stress put on workforce needs to support disaster response. | **20%** | <5% of buses require special fueling logistics or 5% of operators required to alter schedules | 5% - 25% of buses require special fueling logistics or 5% - 25% of operators required to alter schedules | 25% - 50% of buses require special fueling logistics or 25% - 50% of operators required to alter schedules | > 50% of buses require special fueling logistics or > 50% of operators required to alter schedules |
| **Public Safety Impacts** | Impacts to public safety if the ability to fulfill first responder responsibilities are impacted during an emergency response. | **25%** | Able to fulfill all requested emergency response support during incident | Able to fulfill 80% of requested emergency response support during incident) | Able to fulfill 50% of requested emergency response support during incident | Able to fulfill <50% of requested emergency response support during incident |
| **Financial and Operating Impacts** | The loss of revenue from missed service, as well any operational costs required modify or adapt service based on available resources and response requirements. | **15%** | No delays to service | < 4 hour delay in service | 4 - 24 hour delay in service | > 24 hour delay in service |
| **Equipment Damage** | Loss of or damage to transit agency equipment from a hazard. | **10%** | < $3K of equipment damage | $3K-$25K of equipment damage | $25K - $750K of equipment damage | >$750K of equipment damage |

The maximum possible risk score is 4; a higher risk score indicates a higher level of risk. A matrix showing overall risk level by risk score is shown in **Table 23.** In this matrix, the color indicated by the intersection of the threat likelihood and consequences x vulnerability indicates the relative risk value with green meaning less than 0.19 out of 4, yellow indicating 0.2 to 1.9 out of a possible 4 points, light orange indicating a high risk of 1.2 to 2.9 and dark orange indicating a very high risk value of 3 to 4.

*Table 23 – Risk Matrix*

| | | Consequences x Vulnerability | | | |
|---|---|---|---|---|---|
| | | **Low** | **Medium** | **High** | **Very High** |
| **Threat Likelihood** | **Low** | Low Risk | Low Risk | Low Risk | Medium Risk |
| | **Medium** | Medium Risk | Medium Risk | Medium Risk | High Risk |
| | **High** | Medium Risk | High Risk | High Risk | Very High Risk |
| | **Very High** | Medium Risk | High Risk | Very High Risk | Very High Risk |

| | |
|---|---|
| **Low Risk** | **< 0.19** |
| **Medium Risk** | **0.2 to 1.19** |
| **High Risk** | **1.2 to 2.99** |
| **Very High Risk** | **3 to 4** |

The following parameters are key components of the 3R Assessment methodology:

- **ZEB Transition Scenarios:** Future fleet composition alternatives at a specific year.
- **Threats:** An event that will impact the transit agency's ability to provide service or meet first responder capabilities if it occurs. Threats can be natural disasters, equipment failures, intentional attacks, or accidents.
- **Adaptation Measures:** Any activity, procedure, or equipment that can reduce the likelihood of a threat occurring, reduce the vulnerability from experiencing threats, or reduce the level of consequences experienced if a threat occurs.

Assessments are conducted by assessing the threat likelihood, vulnerability, and consequences for a specific scenario-threat pair with no adaptation options. Then, the threat likelihood, vulnerability, and consequences are re-assessed for the same scenario-threat pair with each adaptation option. This approach is summarized in **Figure 47.**

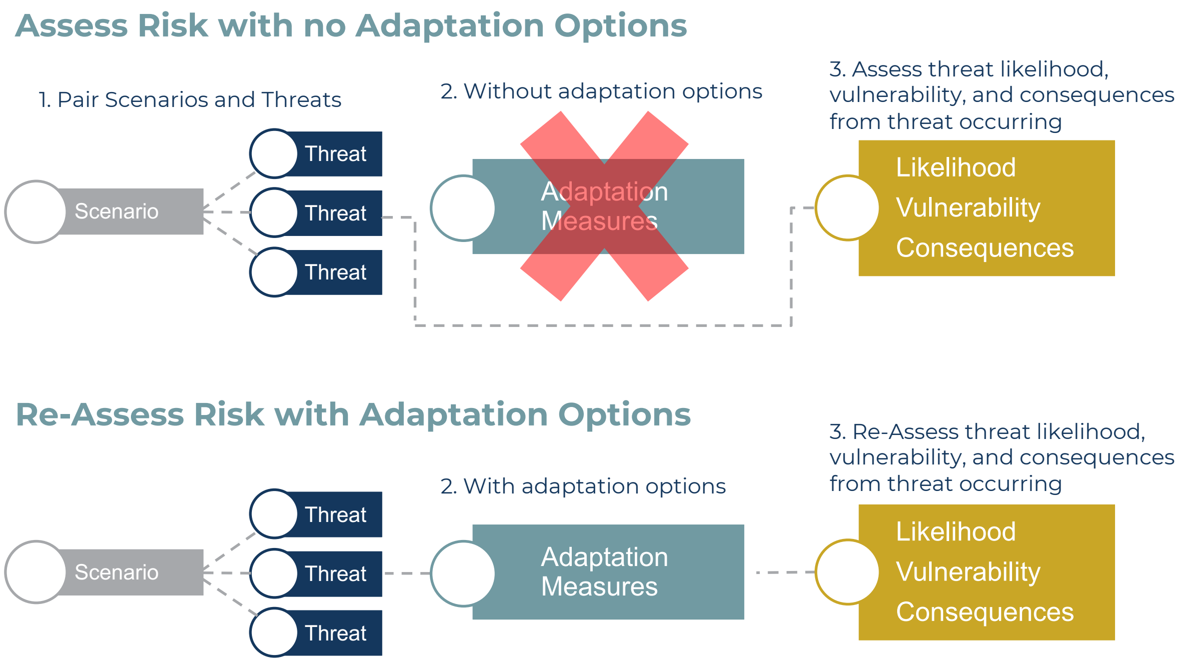



*Figure 47 - 3R Risk Assessment Process*

The following metrics are used to summarize the results of the 3R Risk Assessment:

- **Risk Score:** Level of risk for an analysis, with or without adaptation measure (**Figure 48 - Illustrative Example of Risk Scores**)
    - Risk score = Likelihood x Vulnerability x Consequences
    - Higher risk score = higher risk
    - Lower risk score = lower risk

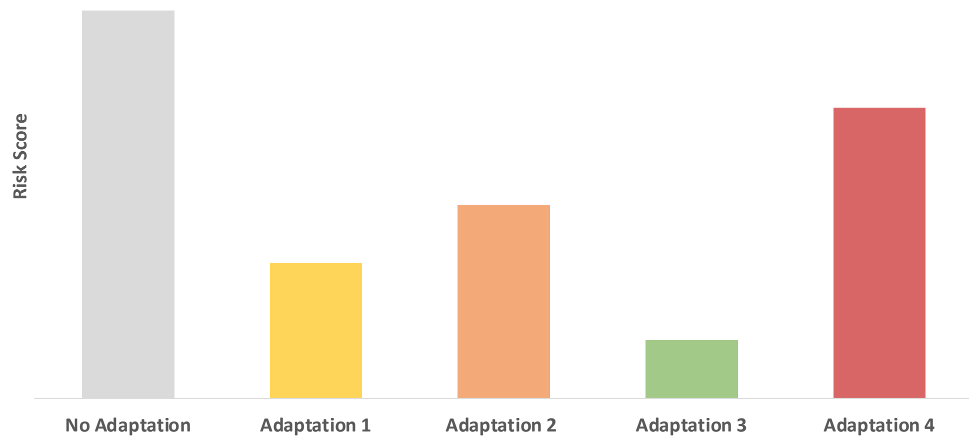



*Figure 48 - Illustrative Example of Risk Scores (Note: This Graph is Provided as an Example and is Not Specific to this Transition Plan)*

- **Risk Reduction Units (RRUs):** Effectiveness of an adaptation measure or package at reducing risk **(Figure 49)**
  - RRU = Risk Score without adaptation measures - Risk Score with adaptation measure or package
  - Higher RRU = more risk reduction
  - Lower RRU = less risk reduction

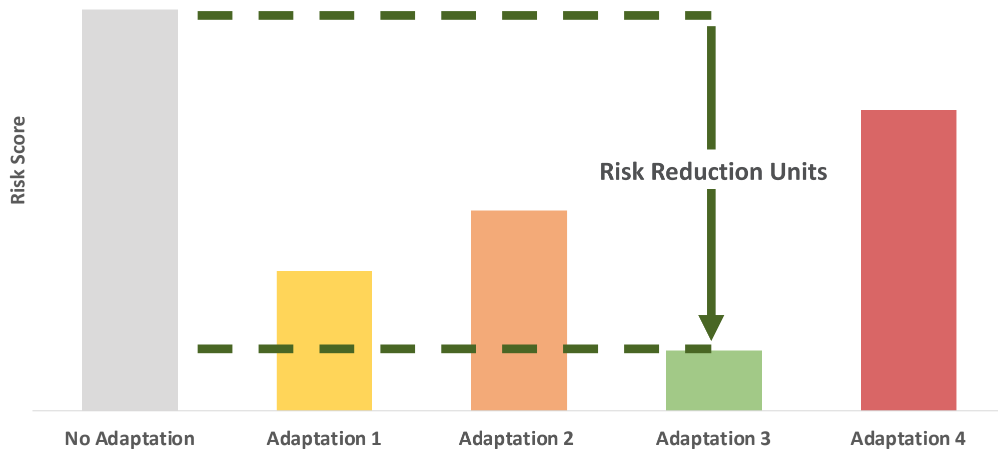



*Figure 49 - Illustrative Example of RRUs (Note: This Graph is Provided as an Example and is Not Specific to this Transition Plan)*

- **$/RRU:** Cost effectiveness of adaptation measures or packages (**Figure 50**)
  - $/RRU = Cost of adaptation measure or package / RRUs
  - Higher $/RRU = less cost effective
  - Lower $/RRU = more cost effective

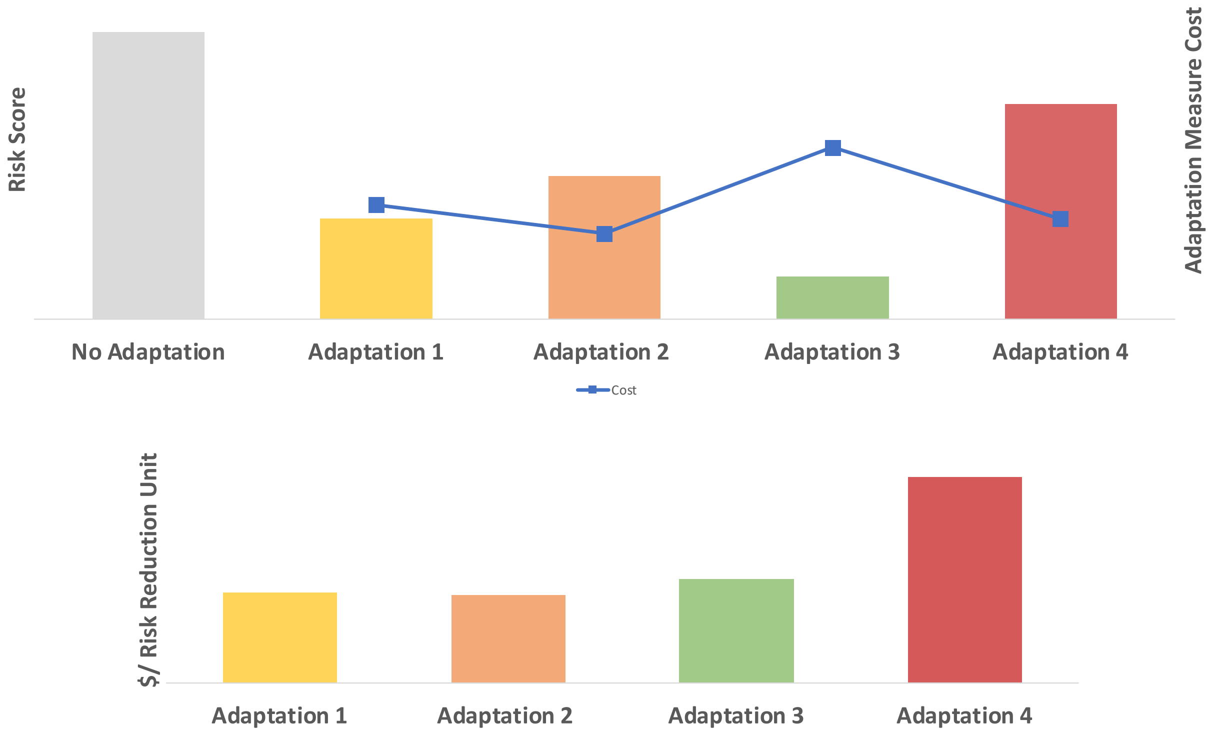



*Figure 50 - Illustrative Example of Using Adaptation Measure Costs to Calculate $/RRU (Note: This Graph is Provided as an Example and is Not Specific to this Transition Plan)*

## Analysis Inputs

Analysis inputs were defined during workshops with CTE and BCAG. Details on the threats considered in the analysis are shown in **Table** 24**.**

*Table 24 - Threats Included in 3R Assessment*

| Threat | Definition | Duration of Impacts | Service Expectation | Threat Likelihood |
|---|---|---|---|---|
| **Power outage due to grid overload/other event** | Power outage in B-Line's service area during ZEB fueling window; no compounding natural disaster impacts to the community. | 8 hours | Normal service | High |
| **Wildfire or flood with large evacuation effort** | Evacuations requiring 75% of fleet on 24/7 basis. Round trip about 40-50 miles; 75% freeway driving, duration about 90 minutes. | 72 hours of evacuation support | Reduced service (Requires 8 buses) | Medium |
| **Wildfire or flood with moderate evacuation effort** | Evacuations requiring 25-50% of the fleet or vehicles required to be staged around the service area. | 24 hours of evacuation support | Baseline service (Requires 17 buses) | Very High |
| **Hydrogen delivery disruption** | Hydrogen shortage due to equipment malfunction or force majeure at production facility interrupts hydrogen deliveries. | 1 week<br>1 month | Normal service<br>Normal service | High<br>Medium |
| **Charging equipment failure** | Charging equipment failure due to software update or electrical issue, all charging equipment impacted. | 1 week | Normal Service | High |

Based on the fleet composition, not every threat is assessed for every scenario. For example, the hydrogen disruption threat was not assessed for the BEB Only scenario. The threat relevance by scenario is shown in **Table 25.**

*Table 25 - Threat Relevance by Scenario*

| Threat | BEB Only | Mixed Fleet - BEB Majority | Mixed Fleet - FCEB Majority | FCEB Only |
|---|---|---|---|---|
| **Power Outage due to Grid overload/other event** | ✓ | ✓ | ✓ | ✓ |
| **Wildfire or Flood with large evacuation effort** | ✓ | ✓ | ✓ | ✓ |
| **Wildfire or Flood with moderate evacuation effort** | ✓ | ✓ | ✓ | ✓ |
| **Hydrogen delivery disruption** | | ✓ | ✓ | ✓ |
| **Charging equipment failure** | ✓ | ✓ | ✓ | |

Adaptation measures are any activity, procedure, or equipment that can reduce the likelihood of a threat occurring, reduce the vulnerability from experiencing threats, or reduce the level of consequences experienced if a threat occurs. The details of the adaptation measures considered in this analysis are listed in **Table 26** . Note that generator size corresponds to the peak demand, not the actual required generator size to provide that level of power continuously.

*Table 26 - Adaptation Measures Used in the 3R Assessment*

| Adaptation Measure | Definition | Estimated Capital Costs | Source |
|---|---|---|---|
| **750 kW Generator** | 750 kW peak demand: 4 x 120 kW chargers + hydrogen fueling station (Or 6 x 120 kW chargers) | Diesel: $220,000<br>Natural gas: $720,000<br>Natural gas microturbine: $1,230,000 | Stantec estimate |
| **300 kW Generator** | 300 kW peak demand: Hydrogen fueling station only (or 2 x 120 kW chargers) | Diesel: $85,000<br>Natural gas: $165,000<br>Natural gas microturbine: $600,000 | Stantec estimate |
| **Solar + Storage** | Additional battery storage for power equipment during a power outage. Assume 750 kW capacity. 1 MWh capacity with 750 kW output would be enough to recharge about 4 buses or could operate the hydrogen fueling station for about 3-4 hours, which could fuel 32 buses back-to-back in 4 hours with two dispensers. | $2,089,000<br>(Does not include operational savings from peak shaving or net metering) | Stantec estimate |
| **Secondary Charging Site** | Two 150 kW chargers with two dispensers each at a secondary location to facilitate keeping vehicles charged while staged for evacuation support; capabilities to charge 4 buses. Assume chargers are locate at an alternate BCAG facility or at the local school district and can be used during a power outage impacting BCAG's bus depot. | $500,000 | CTE estimate of design, construction, and capital costs of charger installation |
| **ICE vehicle contingency fleet** | Retaining 8 retired ICE vehicles to serve as the contingency fleet beyond 2040 (may require a waiver from CARB) | $800,000 | CARB[18] |
| **Additional hydrogen Storage** | 7 days of hydrogen storage on-site (industry standard 3 days) | $830,000 | Stantec estimate |

[18] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2018/ict2018/appg.pdf

Adaptation measures were grouped into packages to assess the combined capabilities of multiple adaptation measures. **Table 27** shows the adaptation measures considered for the analysis. The three backup power adaptation packages (i.e., Small Backup Power, Medium Backup Power + Solar, Large Backup Power) are included to compare risk reduction capabilities and cost effectiveness. Only one of these packages should be selected for implementation. The other two adaptation packages, ICE Contingency Fleet and Additional Hydrogen Storage can be implemented independently of any of the other package options.

*Table 27 - Selected Adaptation Packages for 3R Assessment*

| Adaptation Package Name | Adaptation Measures Included | Estimated Capital Cost |
|---|---|---|
| **Small Backup Power** | 750 kW Generator<br>Secondary charging site | $581,000 - $1,730,000 |
| **Medium Backup Power + Solar** | 300 kW Generator*<br>750 kW Solar array + 750 kW/1 MWh battery storage<br>Secondary charging site | $2,225,000 - $3,189,000 |
| **Large Backup Power** | 750 kW Generator*<br>750 kW Solar array + 750 kW/1 MWh battery storage<br>Secondary charging site | $2,330,000 - $4,119,000 |
| **ICE Contingency Fleet** | ICE Contingency Fleet | $400,000 - $800,000 |
| **Additional Hydrogen Storage** | One week of hydrogen storage | $810,000 - $830,000 |

## Analysis Results

The risk scores by threat and scenario with no adaptation measures are shown in **Figure 51**. Risk scores without adaptation measures represent the worst-case scenario for each threat.

The risk scores for the power outage threat are the same across all scenarios because if this threat occurs and no adaptation measures are implemented, buses will be unable to fuel and will be unavailable for service. Neither chargers nor hydrogen fueling infrastructure can operate during a power outage.

The BEB Only scenario has the highest level of risk for the evacuation effort threats because the BEBs can only conduct three round trips of the defined evacuation route before having to charge. For the Wildfire or Flood with large evacuation effort threat, BEB Only is the only scenario where the required evacuation needs cannot be met. Meeting the required evacuation needs with the BEB Majority scenario will require all buses, therefore no vehicle will be available to provide any reduced service that may be planned during the evacuation. The scenarios with FCEBs can meet the required evacuation needs and service levels with no adaptation. For the Wildfire or Flood with moderate evacuation effort threat, the evacuation needs can all be met with the fleet composition, but provide varying levels of service.

Higher risk scores are seen for the FCEB Majority and FCEB Only threats for the hydrogen delivery disruption threats because less or no service will be provided once the available hydrogen storage runs out, respectively.

The charging equipment failure threat has the highest risk score overall due to the high threat likelihood and high consequences of not being able to charge any BEBs for one week, which would have significant service impacts based on the number of BEBs in the fleet.

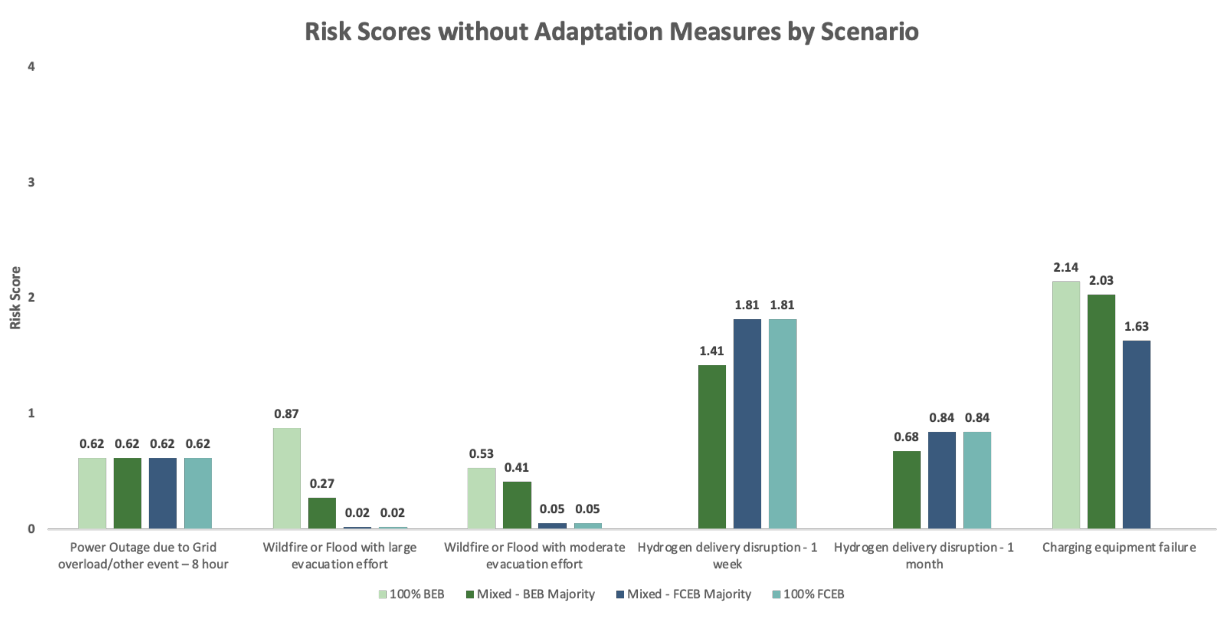



*Figure 51 - Risk Scores without Adaptation Measures by Scenario and Threat*

R3 Assessment results by scenario are shown below.

BEB Only

Risk scores for all BEB Only assessments, without adaptation and with each adaptation package are shown in **Figure 52.**

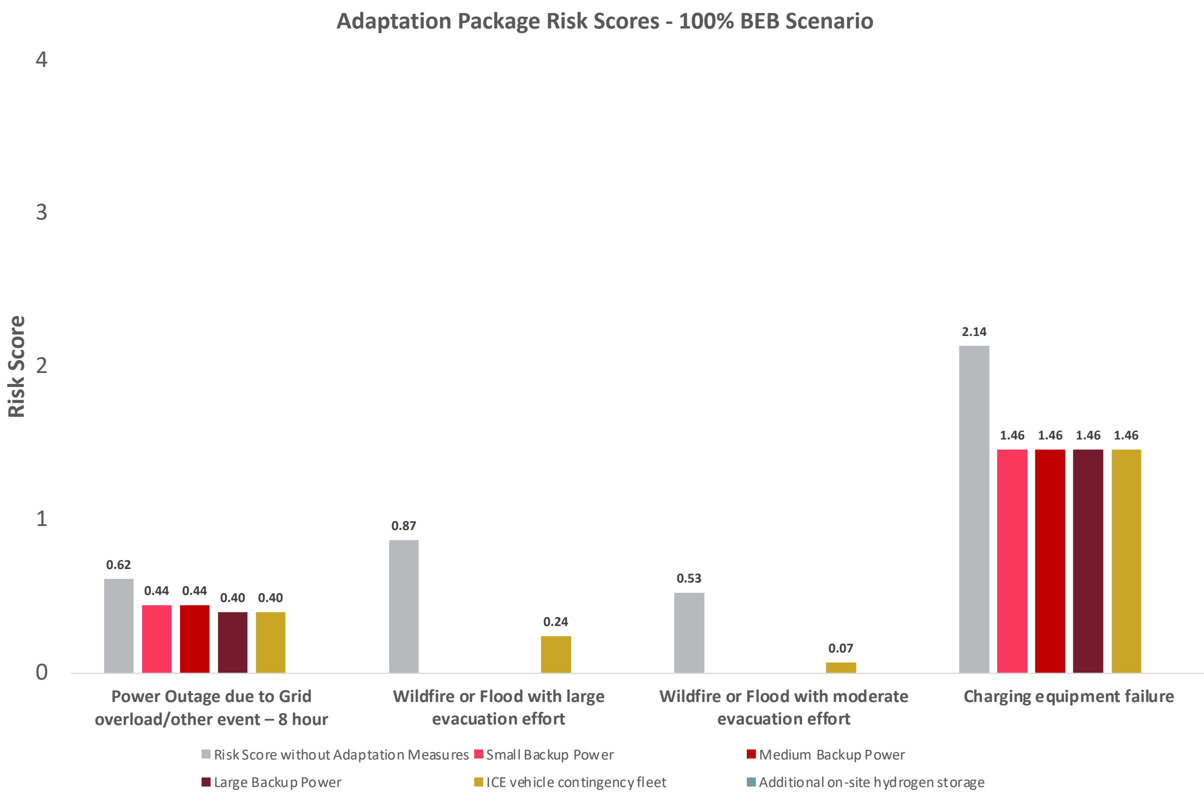



*Figure 52 - Risk Scores for BEB Only Scenario, with and without Adaptation Packages*

The cumulative RRUs for each adaptation package across all threats in the BEB Only scenario are shown in **Figure 53**. The dashed line represents the cumulative risk score for this scenario. While it is not possible to completely reduce risk, this line represents the maximum possible amount of risk reduction from adaptation. The higher the RRUs, the more effective that adaptation package is at reducing risk from threats. The ICE Contingency Fleet adaptation package provides cumulative risk reduction capabilities across all threats.

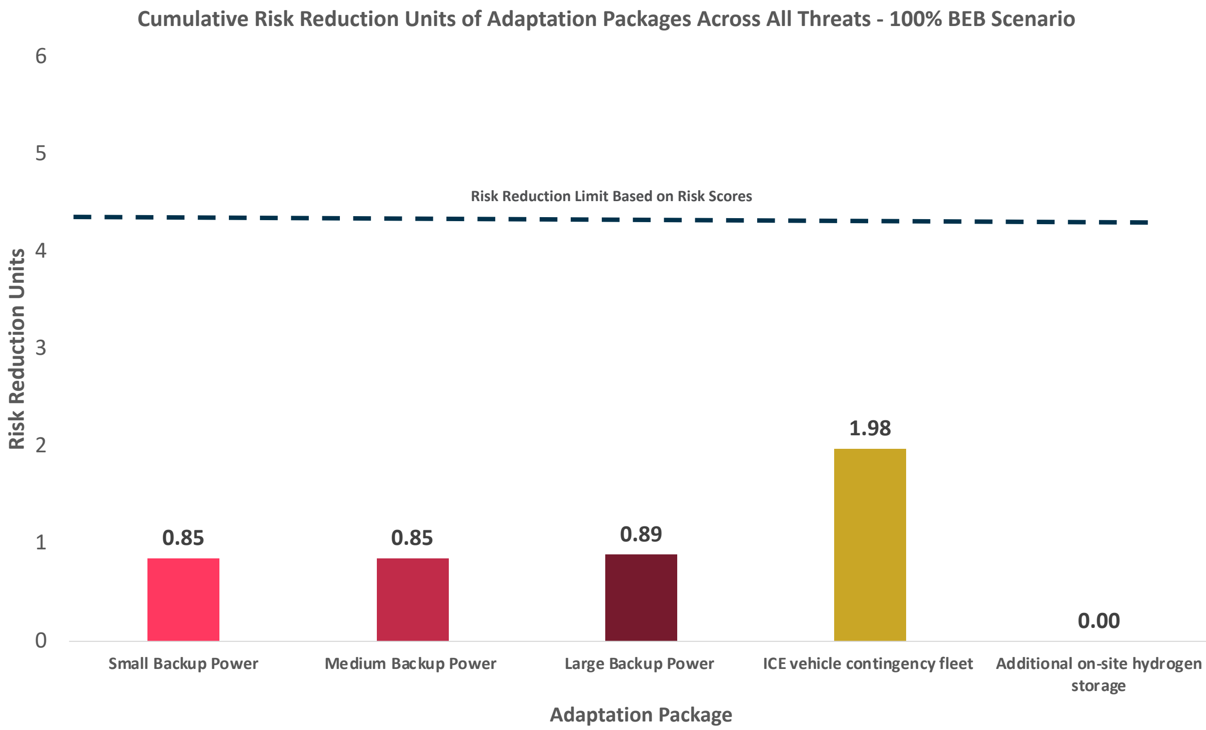



*Figure 53 - Cumulative RRUs for Adaptation Packages for BEB Only Scenario*

The cost effectiveness of the adaptation packages ($/RRU) are shown in **Figure 54**. The costs of diesel, natural gas, and natural gas microturbine backup generators were considered. The fuel type of the generator has no impact on its risk reduction capabilities.

The lower the $/RRU, the more cost effective an adaptation package is. The results of the analysis show the ICE contingency fleet as the most cost effective adaptation package for this scenario.

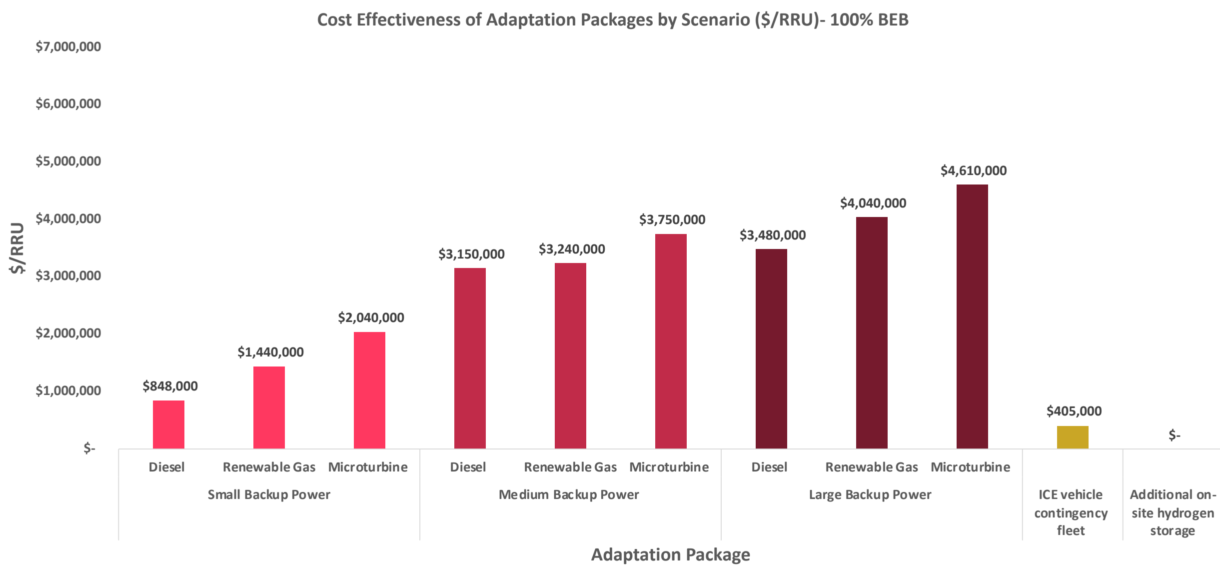



*Figure 54 - $/RRU for Adaptation Packages in the BEB Only Scenario*

Mixed Fleet - BEB Majority Scenario

Risk scores for all Mixed Fleet - BEB Majority scenario assessments, without adaptation and with each adaptation package are shown in **Figure 55**.

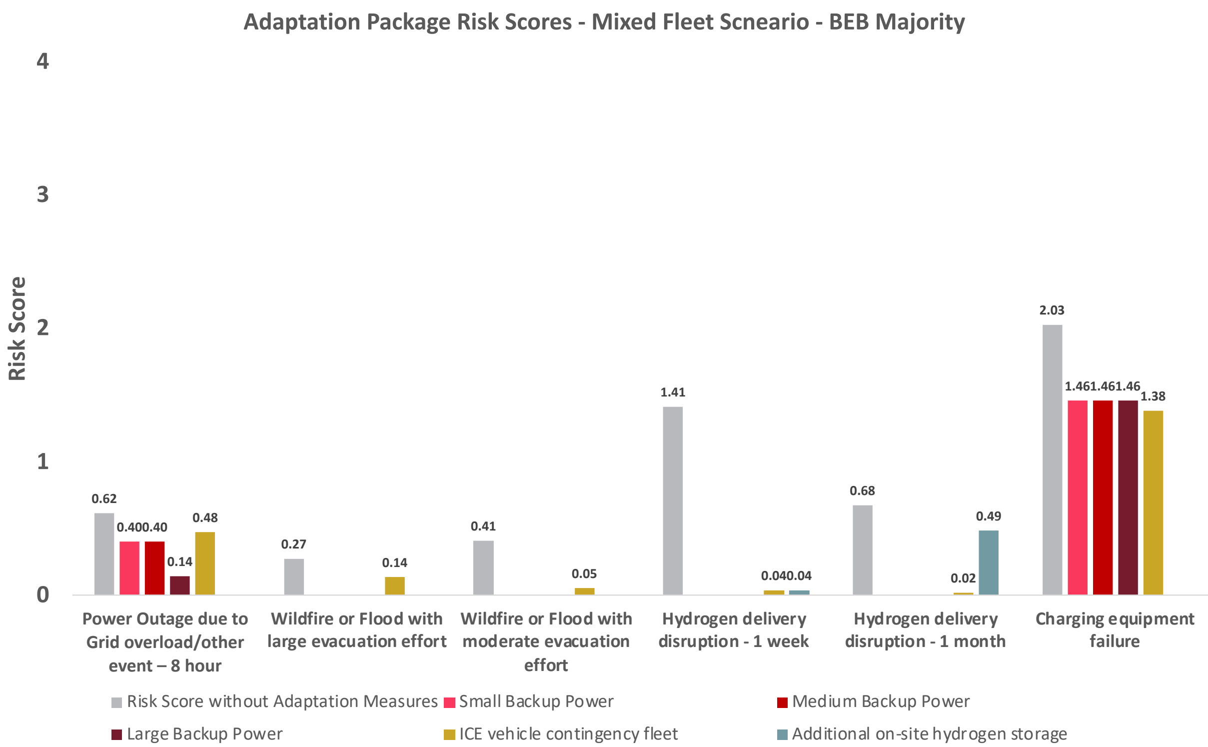



*Figure 55 - Risk Scores for Mixed Fleet - BEB Majority Scenario, with and without Adaptation Packages*

The cumulative RRUs for each adaptation package across all threats in the Mixed Fleet - BEB Majority scenario are shown in **Figure 56**. The dashed line represents the cumulative risk score for this scenario. While it is not possible to completely reduce risk, this line represents the maximum possible amount of risk reduction from adaptation. The higher the RRUs, the more effective that adaptation package is at reducing risk from threats. The ICE Contingency Fleet adaptation package provides cumulative risk reduction capabilities across all threats.

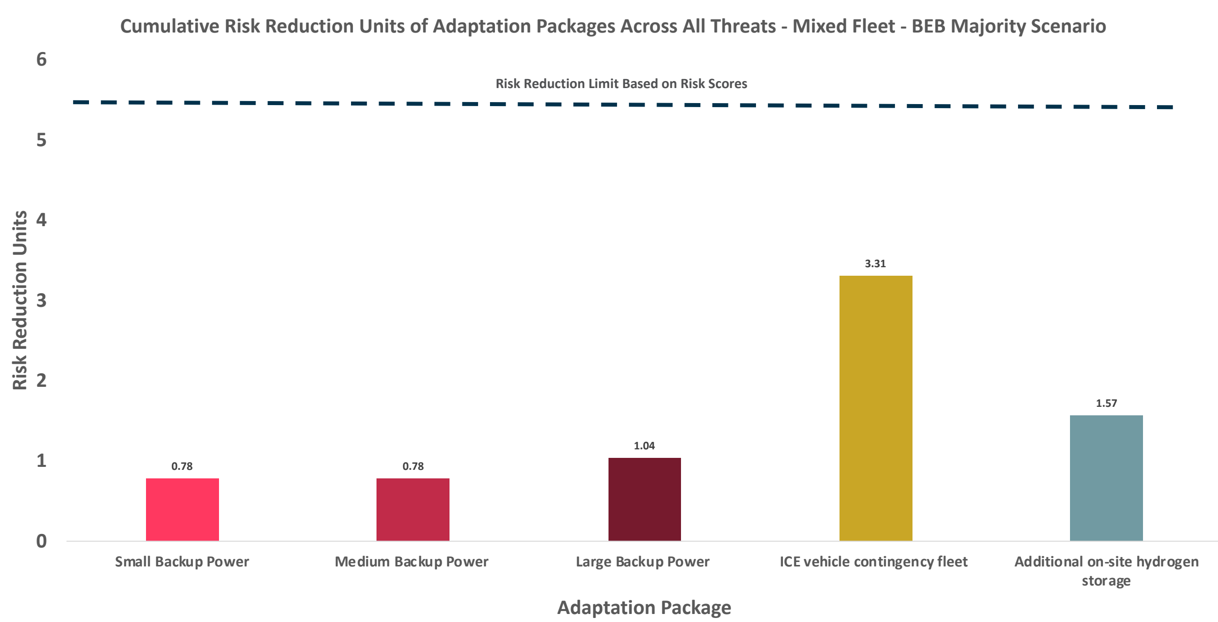



*Figure 56 - Cumulative RRUs for Adaptation Packages for Mixed Fleet - BEB Majority Scenario*

The cost effectiveness of the adaptation packages ($/RRU) are shown in **Figure 57.** The costs of diesel, natural gas, and natural gas microturbine backup generators were considered. The fuel type of the generator has no impact on its risk reduction capabilities.

The lower the $/RRU, the more cost effective an adaptation package is. The results of the analysis show the ICE contingency fleet as the most cost effective.

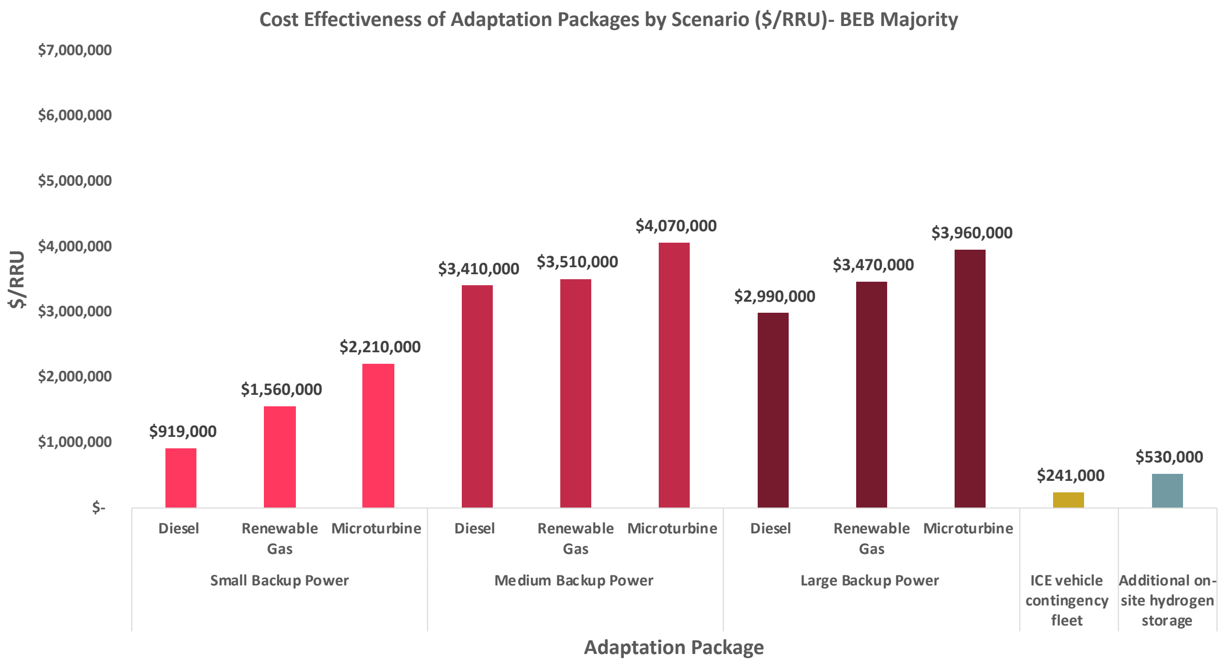



*Figure 57 - $/RRU for Adaptation Packages in the Mixed Fleet - BEB Majority Scenario*

Mixed Fleet - FCEB Majority Scenario

Risk scores for all Mixed Fleet - FCEB Majority scenario assessments, without adaptation and with each adaptation package are shown in **Figure 58**.

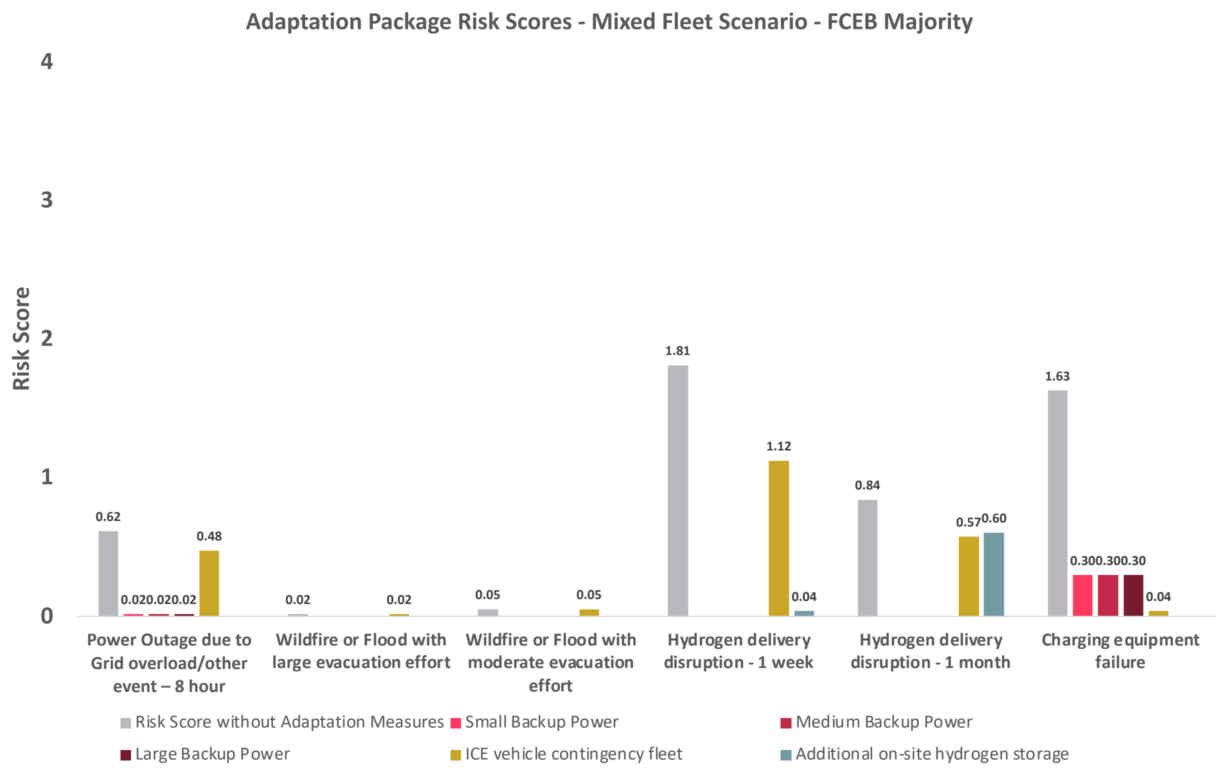



*Figure 58 - Risk Scores for Mixed Fleet - FCEB Majority Scenario, with and without Adaptation Measures*

The cumulative RRUs for each adaptation package across all threats in the Mixed Fleet – FCEB Majority scenario are shown in **Figure 59**. The dashed line represents the cumulative risk score for this scenario. While it is not possible to completely reduce risk, this line represents the maximum possible amount of risk reduction from adaptation. The higher the RRUs, the more effective that adaptation package is at reducing risk from threats. The ICE Contingency Fleet adaptation package provides cumulative risk reduction capabilities across all threats.

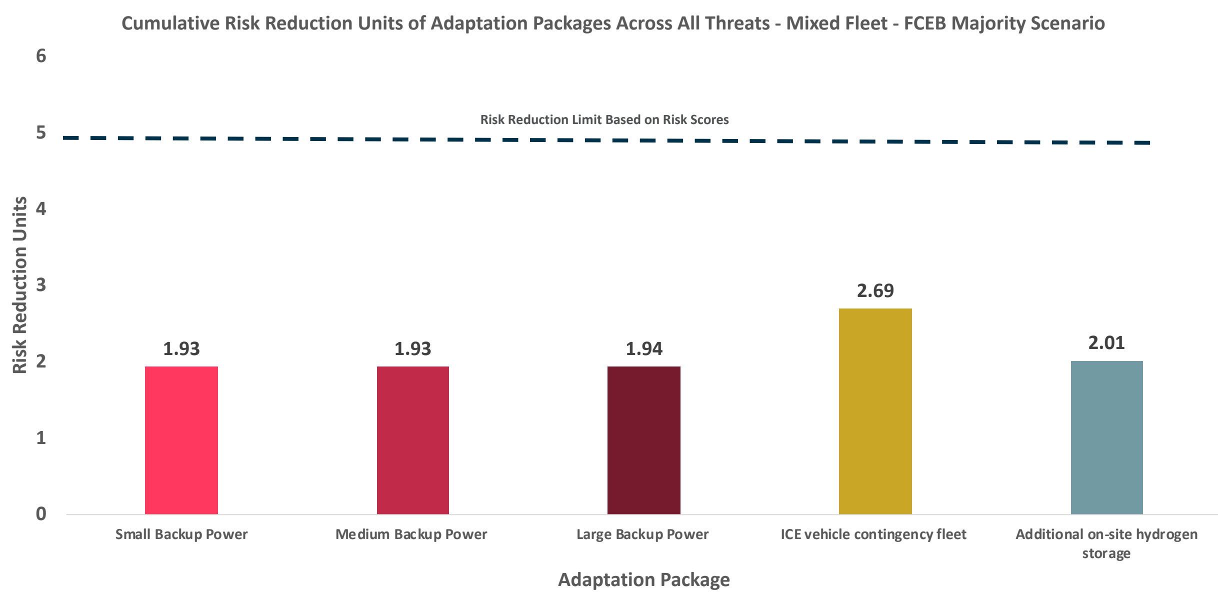



*Figure 59 - Cumulative RRUs for Adaptation Packages for Mixed Fleet - FCEB Majority Scenario*

The cost effectiveness of the adaptation packages ($/RRU) are shown in **Figure 60**. The costs of diesel, natural gas, and natural gas microturbine backup generators were considered. The fuel type of the generator has no impact on its risk reduction capabilities.

The lower the $/RRU, the more cost effective an adaptation package is. The results of the analysis show the ICE contingency fleet as the most cost effective.

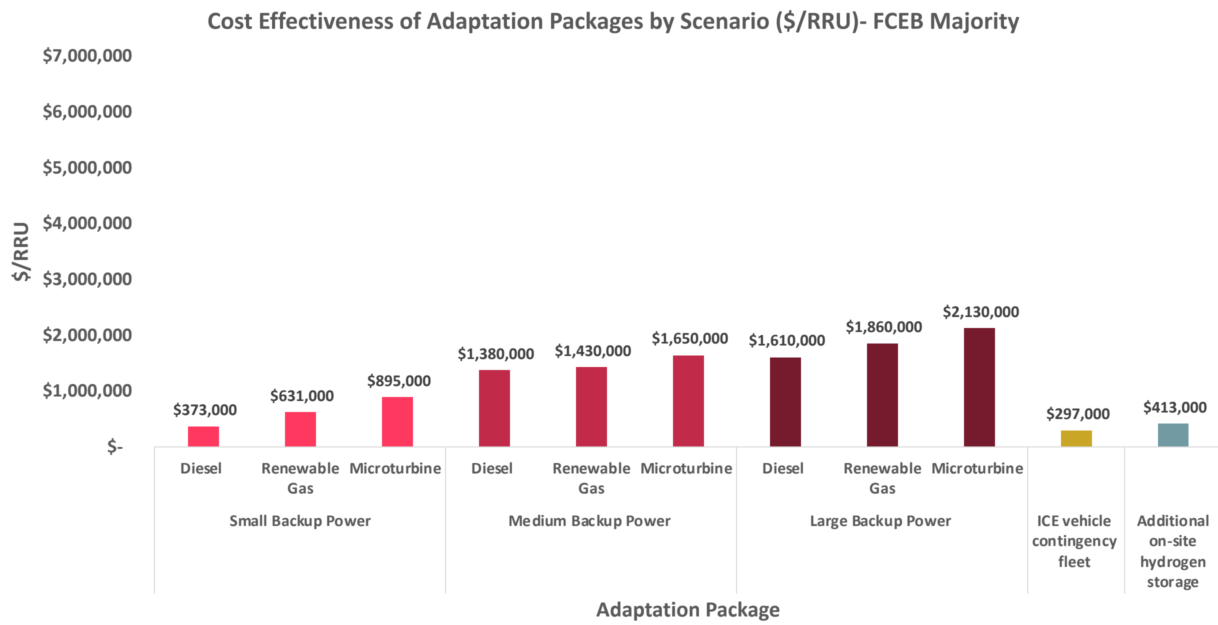



*Figure 60 - $/RRU for Adaptation Packages in the Mixed Fleet - FCEB Majority Scenario*

## FCEB Only

Risk scores for all FCEB Only scenario assessments, without adaptation and with each adaptation package are shown in **Figure 61.**

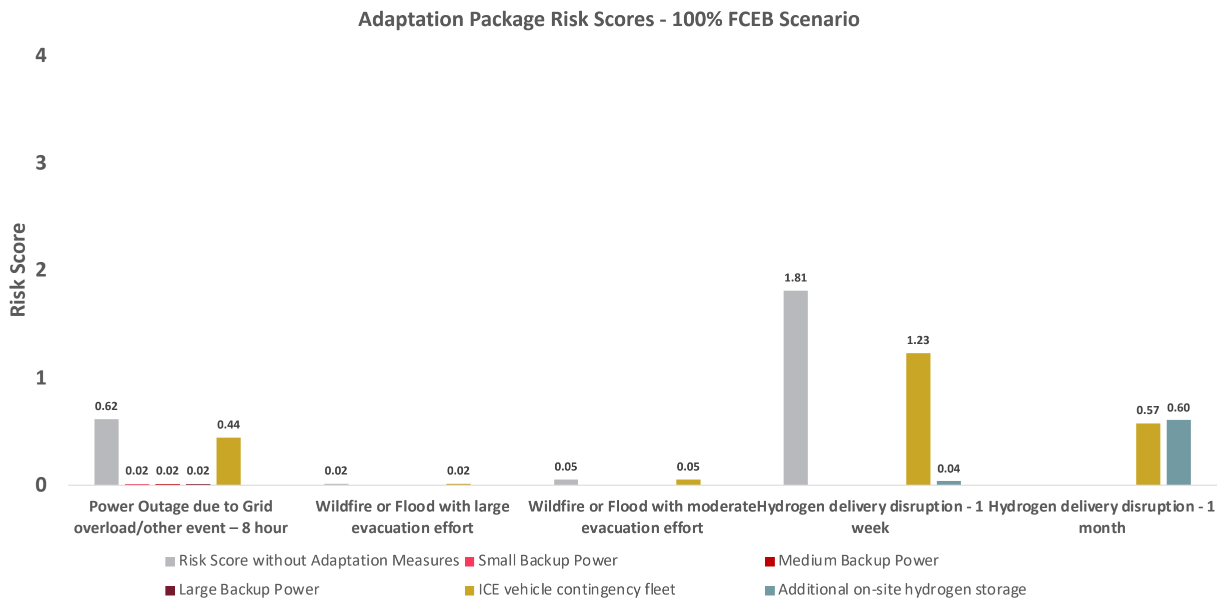



*Figure 61 - Risk Scores for FCEB Only Scenario, with and without Adaptation Packages*

The cumulative RRUs for each adaptation packages across all threats in the FCEB Only scenario are shown in **Figure 62.** The dashed line represents the cumulative risk score for this scenario. While it is not possible to completely reduce risk, this line represents the maximum possible amount of risk reduction from adaptation.  The higher the RRUs, the more effective that adaptation package is at reducing risk from threats. The ICE Contingency Fleet adaptation package provides cumulative risk reduction capabilities across all threats.

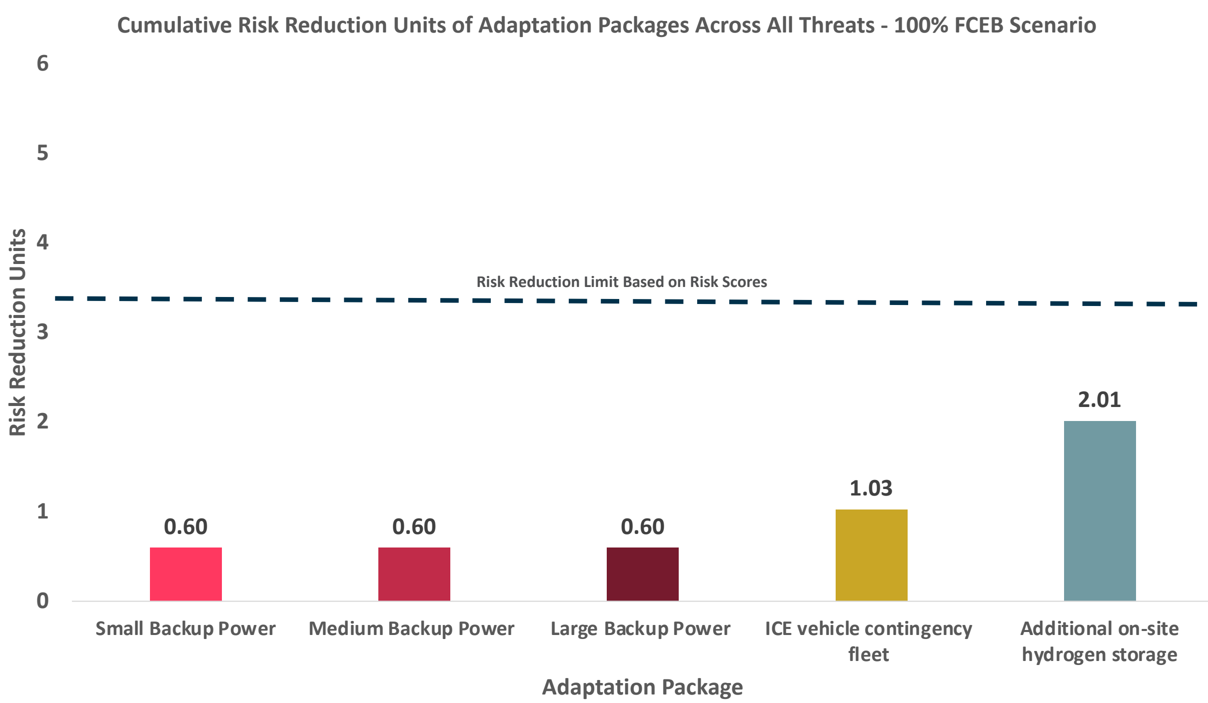



*Figure 62 - Cumulative RRUs for Adaptation Packages for FCEB Only Scenario*

The cost effectiveness of the adaptation packages ($/RRU) are shown in **Figure 63**. The costs of diesel, natural gas, and natural gas microturbine backup generators were considered. The fuel type of the generator has no impact on its risk reduction capabilities.

The lower the $/RRU, the more cost effective an adaptation package is. The results of the analysis show the ICE contingency fleet as the most cost effective.

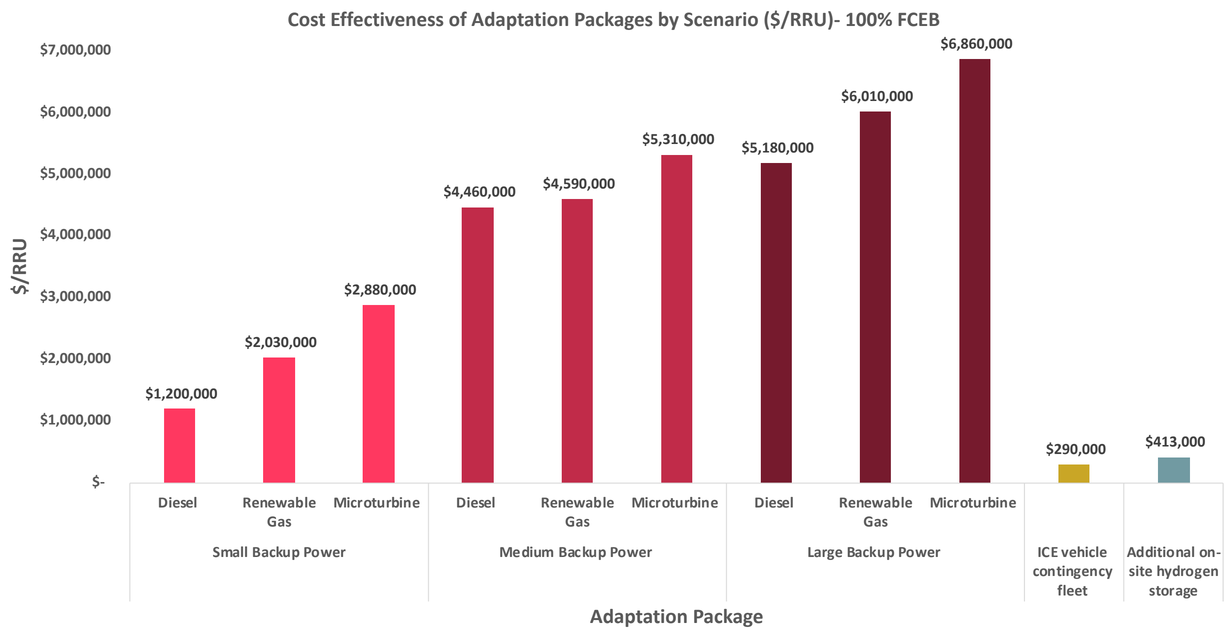



*Figure 63 - $/RRU for Adaptation Packages in the FCEB Only Scenario*

## 3R Assessment Summary

Careful consideration is required to prioritize adaptation package(s) to implement once the ZEB transition scenario is selected. Adaptation package selection will be informed by risk reduction capabilities, cost, operational feasibility, and environmental impacts.

Based on BCAG's transition timeline, no immediate action is required. Adaptation measures should be implemented in advance of when meeting the desired service levels for a threat is at risk, based on the fleet composition.

BCAG is reviewing the assessment results and will use the outcomes to evaluate adaptation measure needs in the future.

# Total Cost of Ownership Assessment

The Total Cost of Ownership Assessment compiles the results from the Fleet, Fuel, Facilities, and Maintenance Assessments to show cumulative and annual costs throughout the transition period for each scenario. It includes selected capital and operating costs of each fleet scenario over the transition timeline. Other costs may be incurred (e.g., incremental operator and maintenance training) during a fleet transition; however, these four assessment categories are the key drivers in ZEB transition decision-making.

This study assumes no cost escalation or any cost reduction due to economies of scale for ZEB technology because there is no historical basis for these assumptions. Future changes to BCAG's service level, depot locations, route alignments, block scheduling, or other operations are unknown. The analyses below provide best estimates using the information currently available and the assumptions detailed throughout this report.

The following sections show total costs per scenario, broken down by assessment type.

## Baseline

**Figure 64** shows the combined fleet, fuel, facilities, and maintenance costs for the Baseline scenario. Since bus capital costs represent the most expensive cost examined, the peaks in these expenses occur during large purchasing years. Compared to bus costs, the fluctuations in fueling and maintenance cost are minimal and appear fairly stable from one year to the next. This scenario assumes necessary infrastructure is needed for the six BEBs currently in BCAG's procurement schedule, there are charging infrastructure costs associated are included in the Baseline scenario. The total combined cost is approximately $76 million from 2021 to 2040. This scenario estimates a total of 27 diesel buses, 5 BEBs and 22 gasoline cutaways in service in 2040 and demonstrates the capital and operation costs BCAG could expect to incur over this period in the absence of the ICT regulation.

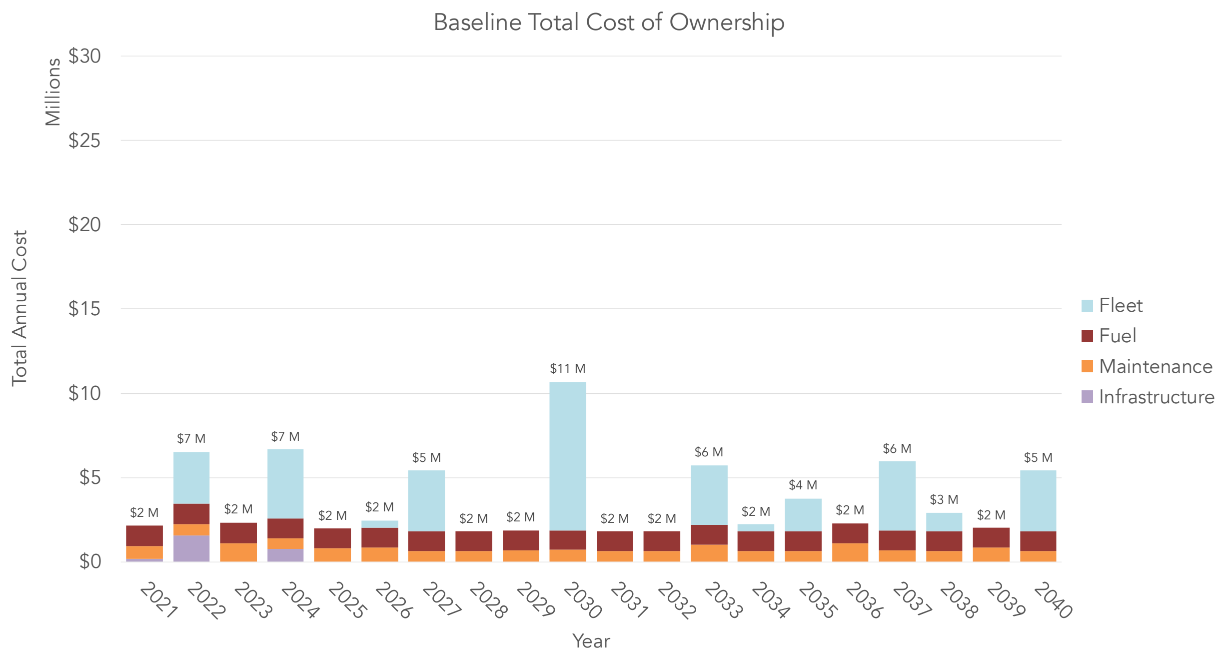



*Figure 64 - Total Costs by Type, Baseline Scenario*

## BEB Only

**Figure 65** shows the combined fleet, fuel, facilities, and maintenance costs for the BEB Only scenario in 2021 dollars. The total combined cost is approximately $88 million over the length of the transition, from 2021 to 2040. This scenario estimates a total of 32 total BEBs in the fleet in 2040, as well as 22 gasoline cutaways. The trends in the total cost fluctuations between years are largely the same as the Baseline scenario, with costs peaking in years with large bus procurements. Bus capital costs are the main component of yearly costs with a large spike of bus capital costs occurring in 2030 due to the purchase of 13 BEBs and 16 cutaways. Infrastructure costs are a significant portion of projected annual expenses towards the middle and latter half of the transition period while maintenance and fueling costs remain relatively stable from year to year. The costs of this scenario are significantly lower than any other zero-emission scenario because of lower vehicle costs and the relatively lower cost of electricity compared to hydrogen at present day pricing. As explored in the Sensitivity Analysis though, there is significant potential for this relationship to switch in the future, with electricity increasing in price as the cost of hydrogen falls.

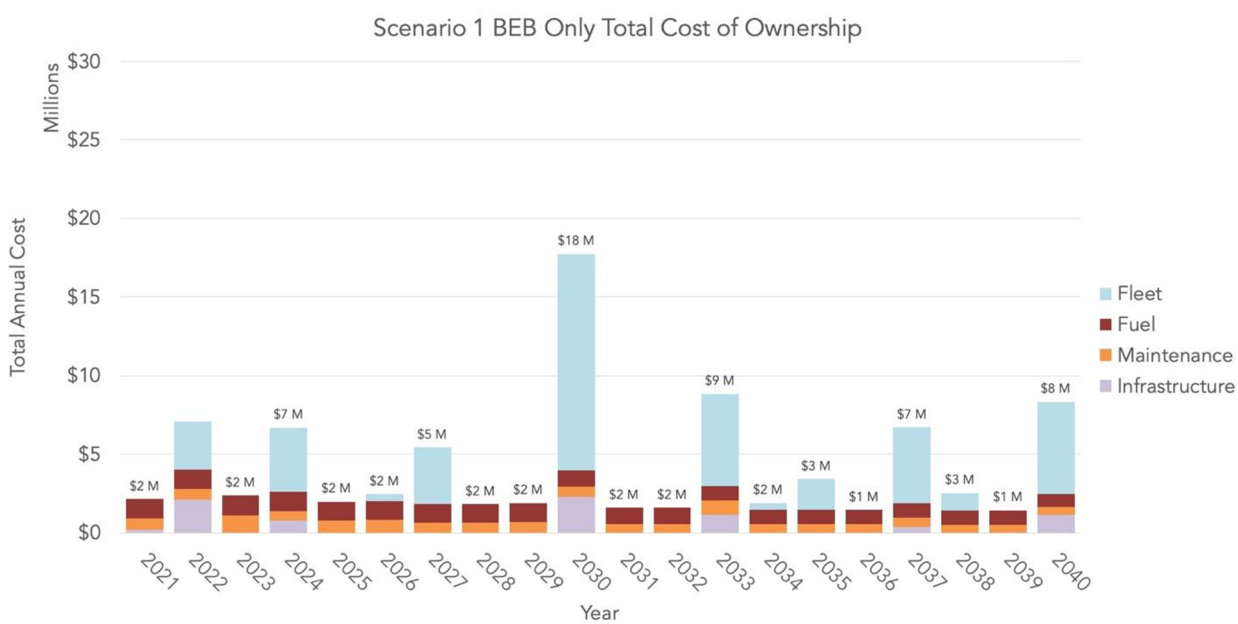



*Figure 65 - Total Costs by Type, BEB Only Scenario*

## Mixed Fleet - BEB Majority

**Figure 66** shows the combined fleet, fuel, facilities, and maintenance costs for the Mixed Fleet – BEB Majority. The total combined cost is approximately $101 million over the length of the transition, from 2021 to 2040. This scenario estimates a total of 24 BEBs, 8 FCEBs, and 4 fuel cell cutaways, and 18 gas cutaways in service by 2040.The high projected annual expense in 2030 is a result of the procurement schedule for this scenario. In 2030, 5 BEBs and 12 FCEBs are scheduled for purchase, as well as 12 cutaways.

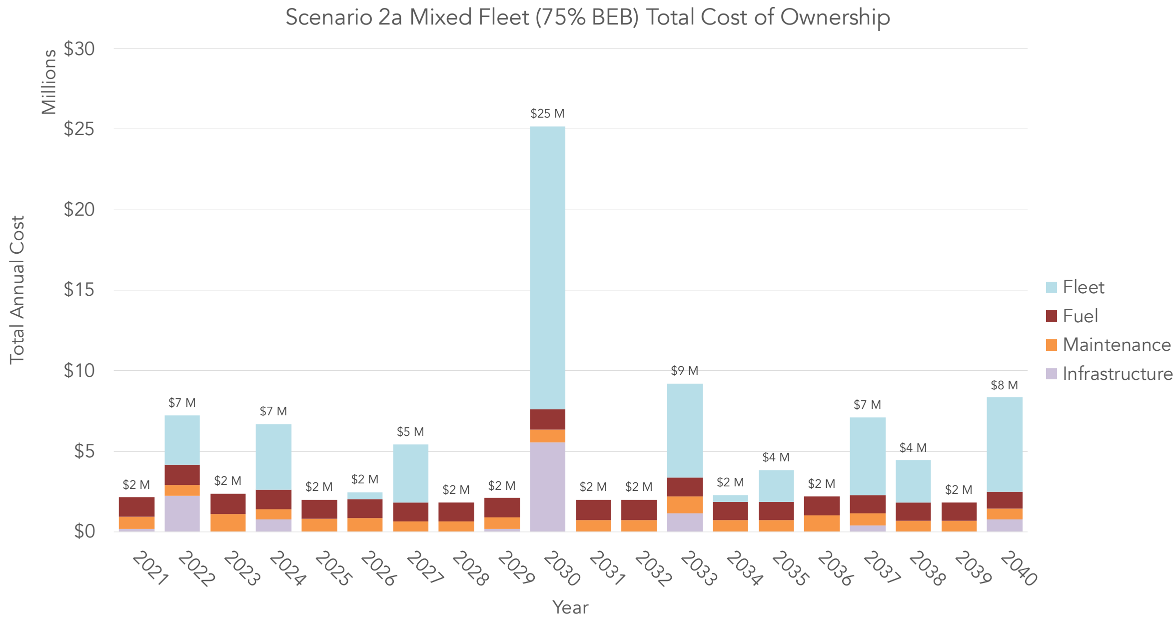



*Figure 66 - Total Costs by Type, Mixed Fleet - BEB Majority Scenario*

## Mixed Fleet - FCEB Majority

**Figure 67** shows the combined fleet, fuel, facilities, and maintenance costs for the Mixed Fleet – FCEB Majority Scenario. The total combined cost is approximately $106 million over the length of the transition, from 2021 to 2040. This scenario estimates 24 FCEBs, 8 BEBs, 4 fuel cell cutaways, and 18 gas cutaways in service by 2040. Similarly, as above, the spikes seen here correlate with the procurement schedule for this scenario. In 2030, 13 FCEBs are scheduled for purchase, as well as 4 fuel cell electric cutaways and 12 gas cutaways.

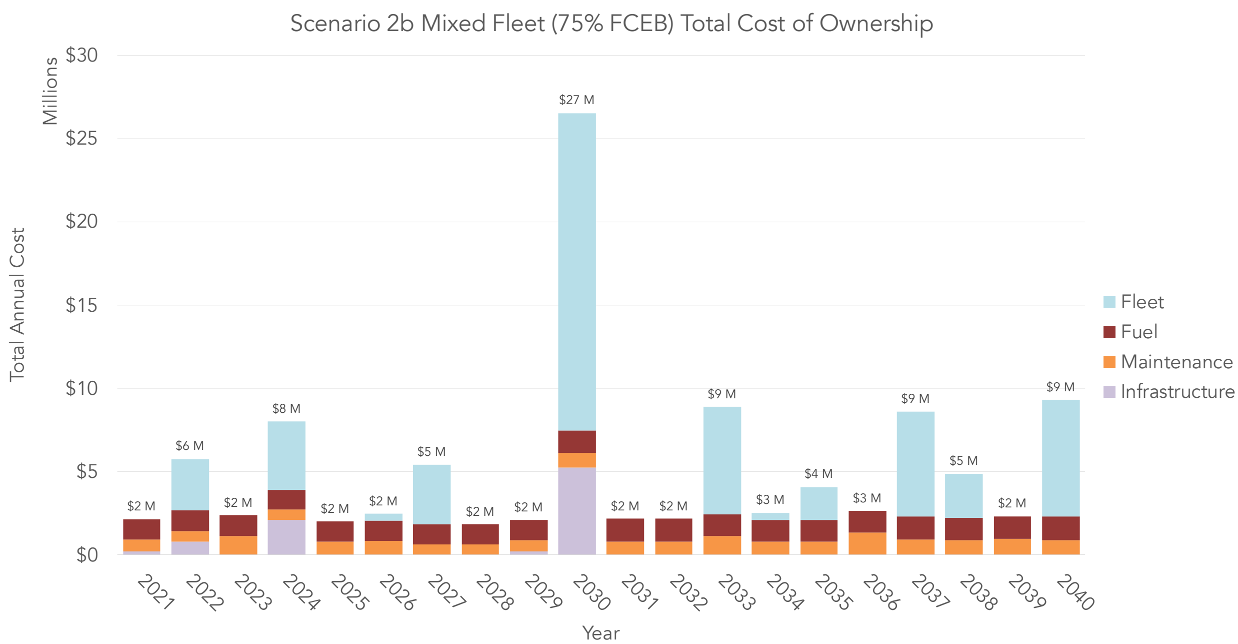



*Figure 67 - Total Costs by Type, Mixed Fleet - FCEB Majority Scenario*

## FCEB Only

**Figure 68** shows the combined fleet, fuel, facilities, and maintenance costs related to the FCEB Only scenario in 2021 dollars. The total combined cost is approximately $110 million over the length of the transition, from 2021 to 2040. This scenario estimates a total of 32 FCEBs and 4 fuel cell cutaways and 18 gas cutaways in service by 2040. The general trends of this scenario are similar to the previous ZEB scenarios discussed, with costs peaking in large procurement years.

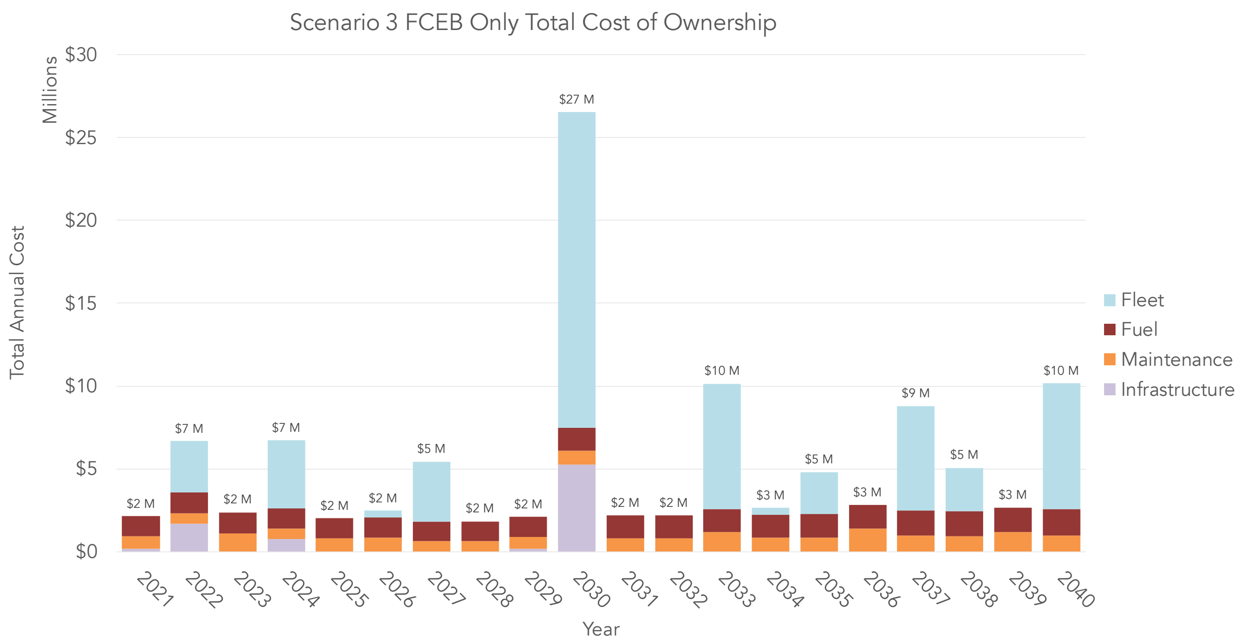



*Figure 68 - Total Costs by Type, FCEB Only Scenario*

## Total Estimated Costs

**Figure 69** shows the combined total costs from the assessments above, broken down by scenario. **Table 28** shows the detailed cost totals. As noted throughout the document, this analysis was completed based on the best available fleet data and procurement schedule available as of 2021. Since the completion of the analysis and the completion of this report, the agency's procurement schedule has changed slightly to include procuring at least 6 BEBs in the near future. Although this change will create a deviation from the Total Cost of Ownership estimates shown below, the impact on the relative cost differentials between scenarios would be fairly negligible as all scenarios would be equally impacted and it would not cause a significant change in the cost comparison of one scenario to the next.

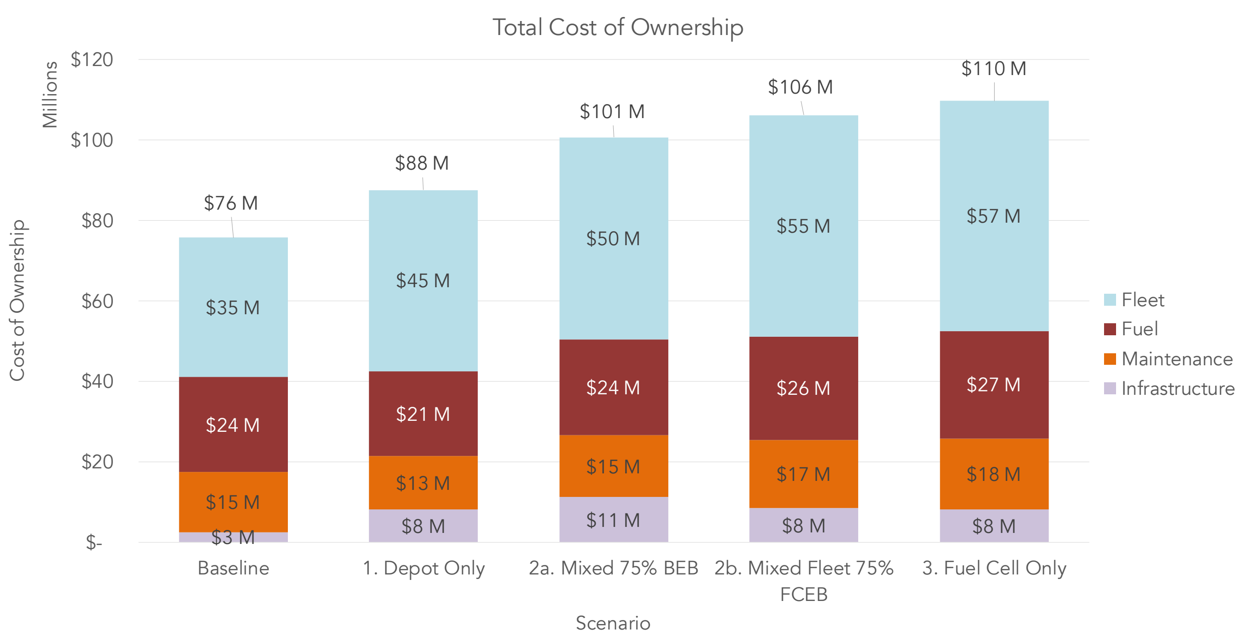



*Figure 69 - Total Cost of Ownership, by Scenario*

*Table 28 - Total Cost of Ownership, by Scenario*

| | 0. Baseline (Current Technology) | 1. BEB Only | 2. Mixed Fleet - (BEB Majority) | 3. Mixed Fleet (FCEB Majority) | 4. FCEB Only |
|---|---|---|---|---|---|
| **Fleet** | $ 35M | $ 45M | $ 50M | $ 55M | $ 57M |
| **Fuel** | $ 24M | $21M | $ 24M | $ 26M | $ 27M |
| **Maintenance** | $ 15M | $ 13M | $ 15M | $ 17M | $ 18M |
| **Infrastructure** | $ 3 | $ 8M | $ 11M | $ 8M | $ 8M |
| **TOTAL** | **$ 76M** | **$ 88M** | **$ 101M** | **$106M** | **$ 110M** |

*Assumes near-term costs with no sensitivity analysis applied.

## Conclusions and Recommendations

ZEB technologies are in a period of rapid development. While the technologies have been proven in many pilot deployments, they are not yet matured to the point where they can easily replace current ICE technologies on a large scale. BEBs require significant investment in facilities and infrastructure and may require changes to service and operations to manage their range constraints. On the other hand, FCEBs can provide an operational equivalent to diesel buses, but the cost of buses, fueling infrastructure, and fuel remain a significant barrier to mass adoption.

CARB's ICT regulation is an achievement in addressing the challenges of climate change and improving local air quality through the goal of 100% zero-emission transit fleets by 2040. However, as demonstrated in this analysis, there will be substantial costs and technical challenges to overcome.

The BEB Only scenario meets the CARB ICT regulation. Total transitional costs under this scenario are likely to be around $88 million. The difference in cost between this scenario and the Baseline scenario is largely the result of the price difference between diesel buses and BEBs and up-front capital costs for new fueling infrastructure. This scenario is projected to cost approximately $12 million more than the baseline over the transition period.

In a Mixed Fleet – BEB Majority scenario, the total cost is estimated at $101 million. Managing a mixed fleet through a transition presents its own complexities, such as installing new BEB charging infrastructure and new FCEB fueling infrastructure in a time frame that does not disrupt service or depot access. A mixed fleet does, however, provide enhanced resilience as it means that portions of the fleet would still be able to operate in the event that fuel delivery of either fuel was disrupted. This scenario also allows the agency to benefit from the lower cost of BEBs compared to FCEBs as much as possible, while still maintaining the benefits that come with a diverse fleet. This scenario is projected to cost approximately $25 million more than the baseline over the transition period and meets the requirements of the ICT regulation.

The Mixed Fleet – FCEB Majority scenario achieves the transition of B-Line's fleet to 100% zero-emission by 2040 with an estimated total cost of $106 million. This scenario has similar costs and benefits as the last scenario in terms of requiring two kinds of fueling infrastructure at the depot, but provided enhanced resilience. While this scenario results in higher fleet, fuel and maintenance costs than the BEB Majority Scenario at present pricing, this scenario's advantage is that having more FCEBs in the fleet allows the agency to take advantage of the lower infrastructure costs that come from installing a single FCEB station and fewer chargers than the previous scenario. This scenario is projected to cost approximately $30 million more than the baseline over the transition period and meets the requirements of the ICT regulation.

Total cost for the FCEB Only scenario is estimated at approximately $110 million and result in an entirely fuel cell electric bus fleet by 2040. While only accommodating a single technology, the FCEB Only scenario has a larger total cost due to higher bus capital, maintenance, and fuel cost as compared to diesel or BEBs. A primary assumption for the FCEB analysis is that FCEBs are already available for all bus types and lengths during the transition period. Due to the lack of market diversity of FCEBs and hydrogen availability in the United States, fuel costs and bus capital costs remain high. These costs are largely expected to decrease in the future as more buses are deployed; however, more data is needed to understand how much they may decrease. Additionally, data for FCEB maintenance costs reflect higher costs than what might be expected as agencies become more familiar with the technology. As such, there are more unknowns associated with costs for the FCEB Only scenario, and costs are more subject to change. This scenario is projected to cost approximately $34 million more than the baseline over the transition period and meets the requirements of the ICT regulation.

Given these considerations, the recommendations for BCAG are as follows:

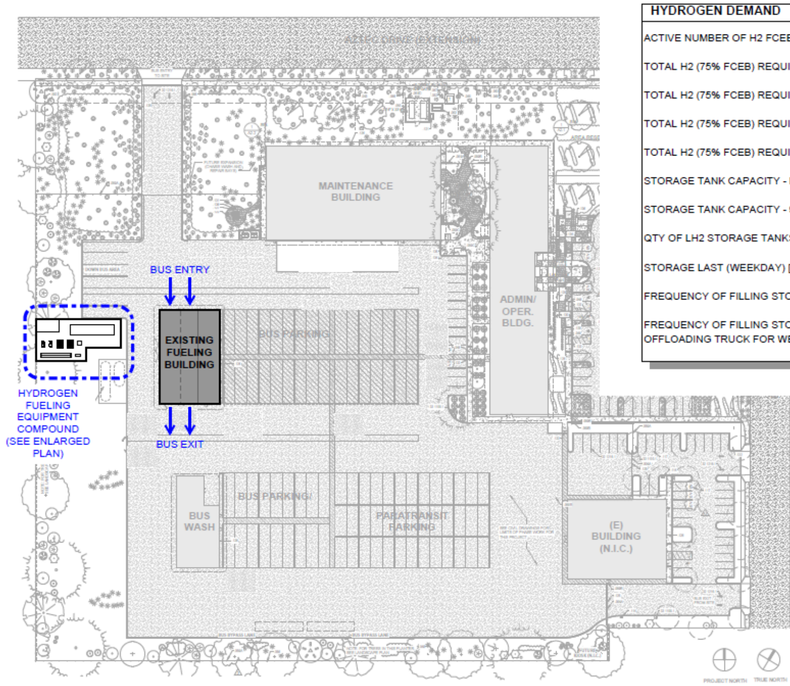
1) **Select a preferred scenario to refine in ICT Plan development and remain proactive with ZEB deployment grants:** This Master Plan was developed to present BCAG with options for transitioning to a fully zero-emission fleet. Following BCAG's selection of a preferred ZEB Transition Scenario, the ICT Rollout Plan will be developed for submittal to CARB in compliance with the ICT Regulation. This document will put forth BCAG's vision for a ZEB Transition and will act as a living document to help the agency plan out grant funding

requirements. As a greater proportion of B-Line's fleet converts to ZEB technology, auxiliary equipment, hardware, and software will be needed to ensure a successful fleet transition. BCAG should continue to remain proactive in the purchase and deployment of ZEBs and their associated systems by taking advantage of various grant and incentive programs.

2) **Apply learnings from emergency disaster response:** Evaluate the tradeoffs for various alternatives to reduce the risk from power outages and fuel disruptions, and allow BCAG to meet all first responder requirements from the 3R Assessment.
3) **Match the individual bus technology to the individual route and blocks:** BCAG should consider the strengths of given ZEB technologies and focus those technologies on routes and blocks that take advantage of their efficiencies and minimize the impact of the constraints related to the respective technologies. These technologies cannot follow a one-size-fits-all approach from either a performance or cost perspective. Matching the present technology to the present service levels will be a critical best practice.
4) **Monitor local and regional developments:** In the zero-emission technology sector, developments at the local level can have the ability to catapult the industry forward. When local bus OEMs or fuel providers enter the zero-emission market, it can spark technological innovation or cost reduction. Neighboring transit agencies can also work together through group purchasing agreements and lobbying efforts to bring about reduced purchase costs or more funding opportunities.

The transition to ZEB technologies represents a paradigm shift in bus procurement, operation, maintenance, and infrastructure. It is only through a continual process of deployment with specific goals for advancement that the industry can achieve the goal of economically sustainable, zero-emission public transit. Widespread adoption of zero-emission bus technology has the potential to significantly reduce greenhouse gas (GHG) emissions resulting from the transportation sector. BCAG is committed to implementing environmentally-friendly policies and reducing its carbon footprint.

## Appendices – BCAG Depot Site Plans




| HYDROGEN DEMAND | |
|---|---|
| ACTIVE NUMBER OF H2 FCEB VEHICLES (40' / CUTAWAY) | 24 / 4 |
| TOTAL H2 (75% FCEB) REQUIRED/DAY (WEEKDAY) [KG] | 626 |
| TOTAL H2 (75% FCEB) REQUIRED/DAY (WEEKDAY) [GAL] | 2,335 |
| TOTAL H2 (75% FCEB) REQUIRED/DAY (WEEKEND) [KG] | 178 |
| TOTAL H2 (75% FCEB) REQUIRED/DAY (WEEKEND) [GAL] | 664 |
| STORAGE TANK CAPACITY - NOMINAL [GAL] | 12,000 |
| STORAGE TANK CAPACITY - 90% USABLE [GAL] | 10,800 |
| QTY OF LH2 STORAGE TANKS | 1 |
| STORAGE LAST (WEEKDAY) [DAYS] | 4.5 |
| FREQUENCY OF FILLING STORAGE PER WEEK | 1.0 |
| FREQUENCY OF FILLING STORAGE DELIVERED BY OFFLOADING TRUCK FOR WEEKDAY CONSUMPTION | ONE FUEL DELIVERY EVERY 4-5 WEEKDAYS |

**NOTES:**

1. HYDROGEN DISPENSERS MAY BE LOCATED IN EXISTING FUELING STATION. DISPENSERS SHOULD BE LOCATED IN AN OPEN-AIR LOCATION. DETAILS WILL BE STUDIED IN DESIGN PHASE FOR BEST LOCATION.

2. PER ABOVE TABLE, 24 (40-FT) BUSES AND 4 CUTAWAYS ARE CONSIDERED FOR CALCULATING STORAGE AND FREQUENCY OF DELIVERY.

3. PER ABOVE TABLE A 12,000 GAL STORAGE TANK WILL LAST ABOUT 4 TO 5 DAYS PER WEEKDAY CONSUMPTION.

4. CONSIDERING LESS FUEL CONSUMPTION OVER WEEKENDS, ONE FUEL DELIVERY WOULD BE NEEDED EVERY 4 TO 5 WEEKDAYS.

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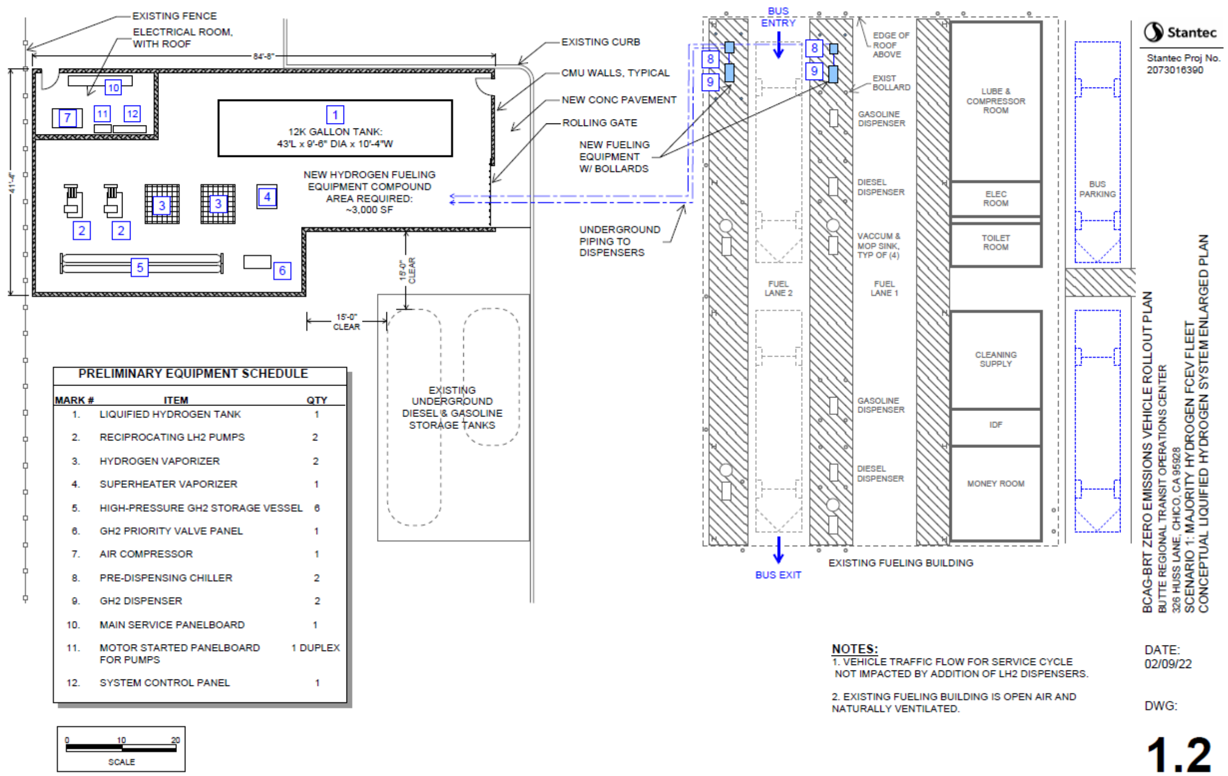
Stantec Proj No.
2073016390

BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 1: MAJORITY HYDROGEN FCEV FLEET
CONCEPTUAL LIQUIFIED HYDROGEN SYSTEM SITE PLAN

DATE:
02/09/22

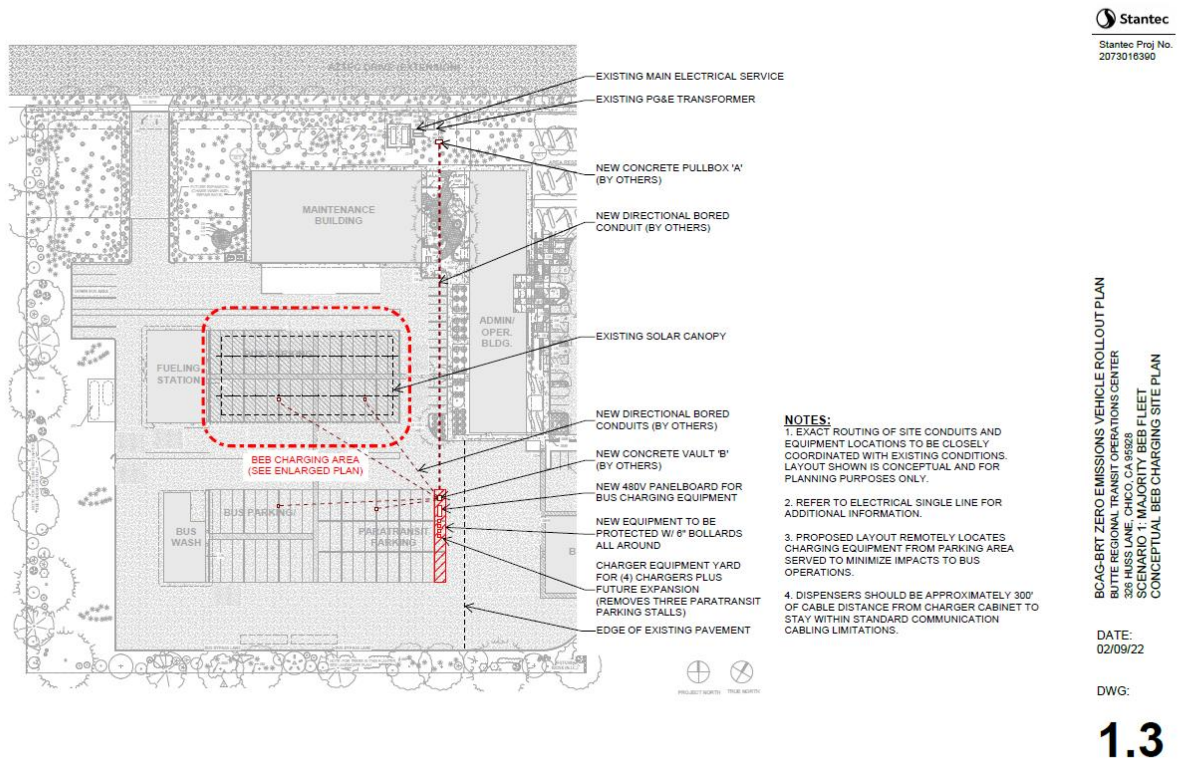
DWG:

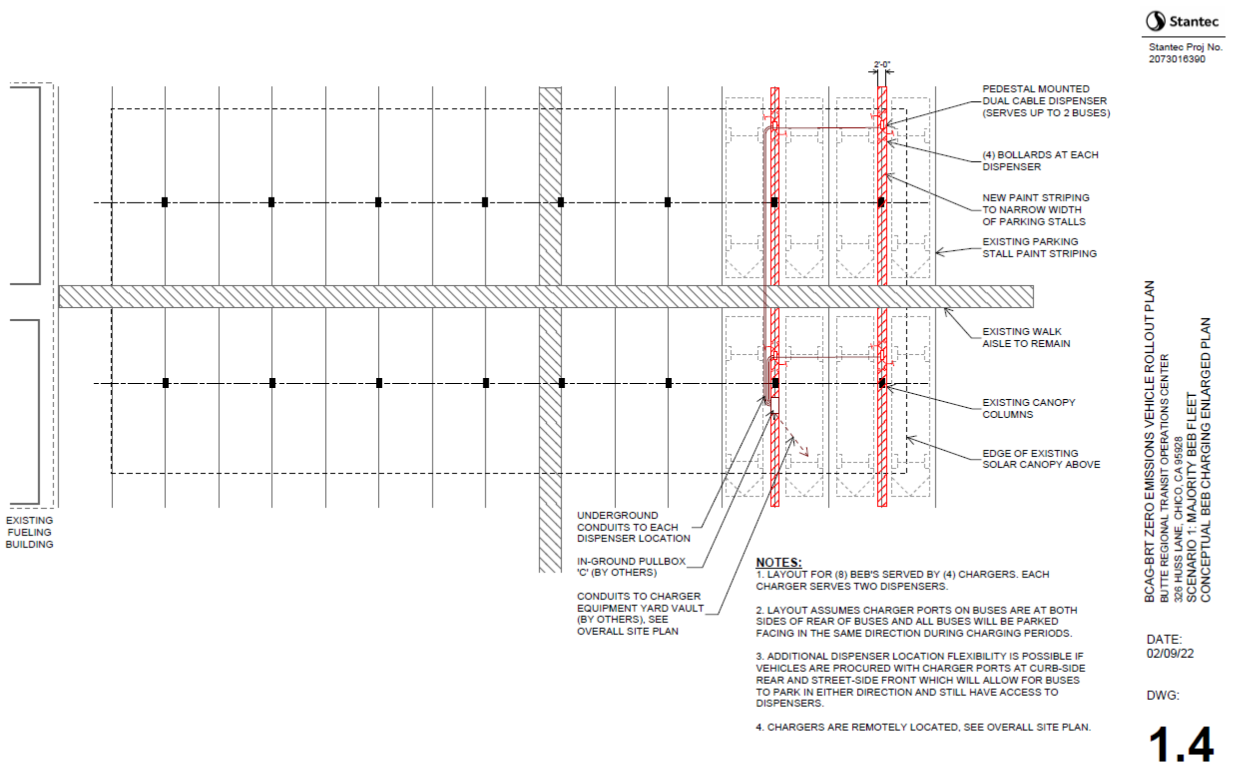
**1.1**

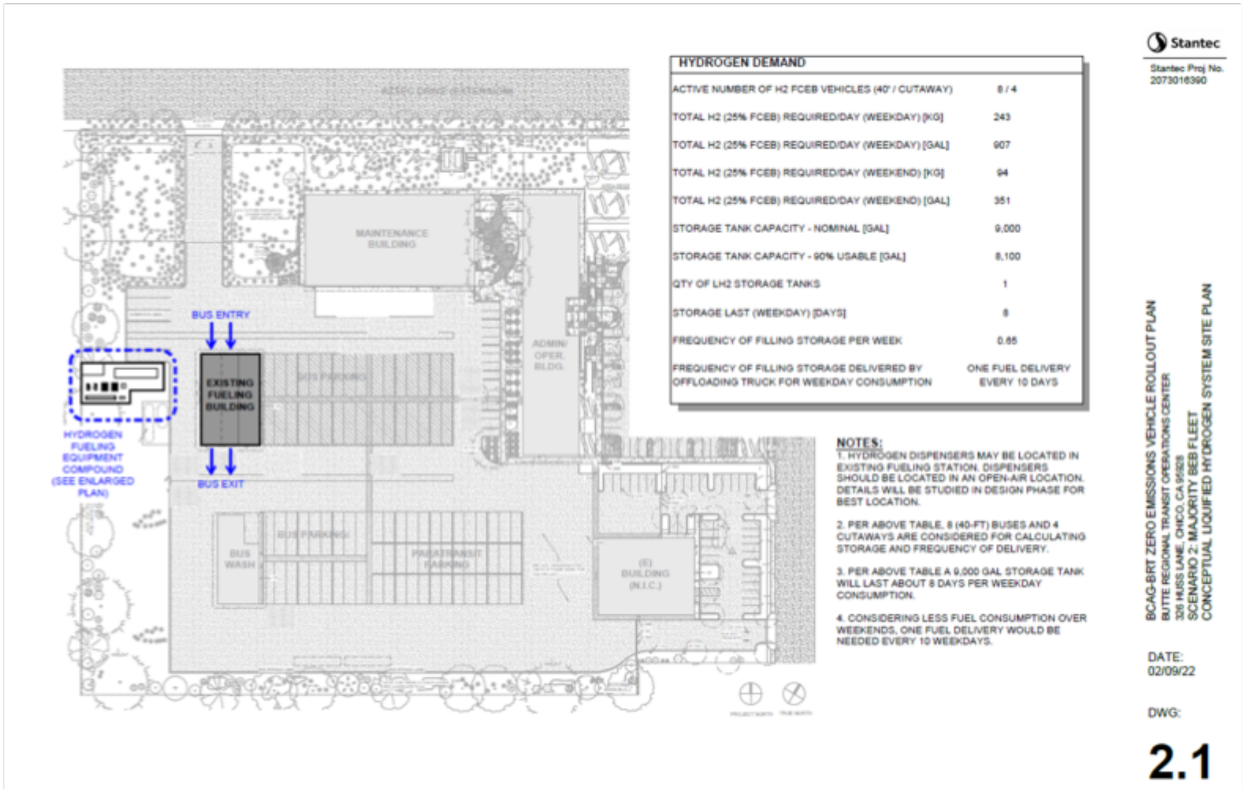


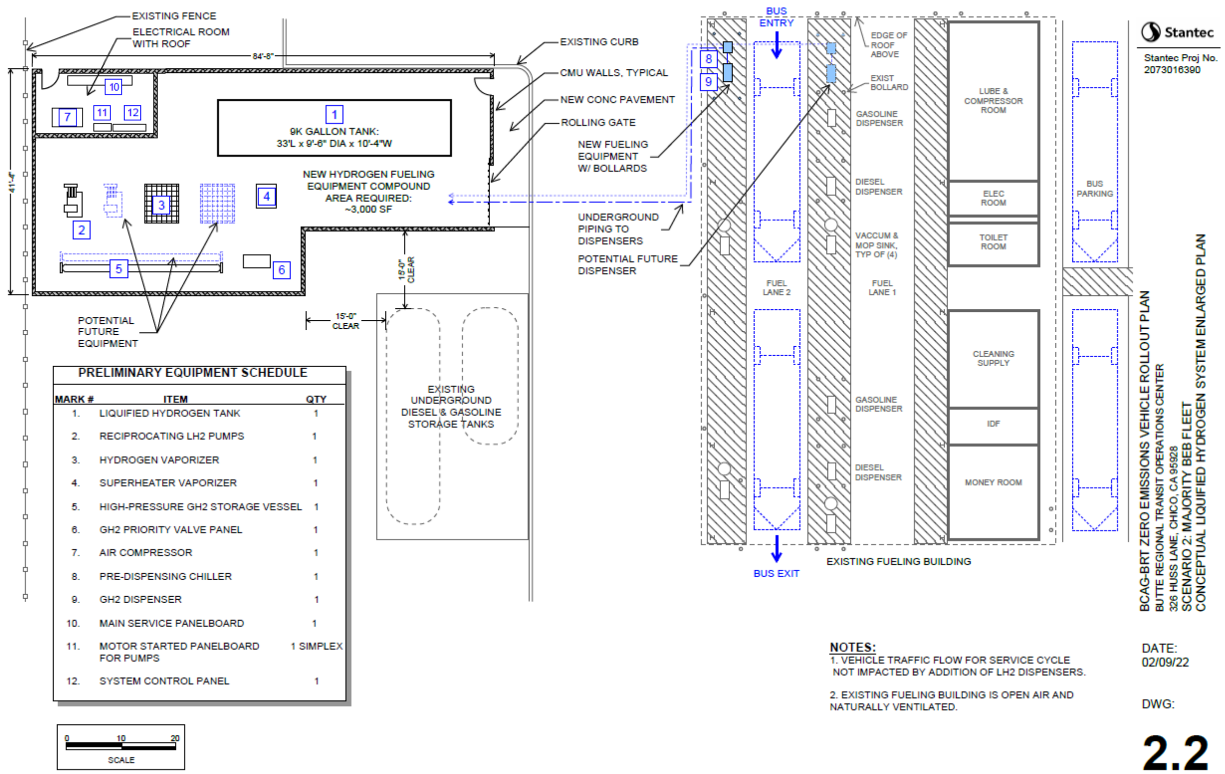

PRELIMINARY EQUIPMENT SCHEDULE

| MARK # | ITEM | QTY |
|---|---|---|
| 1. | LIQUIFIED HYDROGEN TANK | 1 |
| 2. | RECIPROCATING LH2 PUMPS | 2 |
| 3. | HYDROGEN VAPORIZER | 2 |
| 4. | SUPERHEATER VAPORIZER | 1 |
| 5. | HIGH-PRESSURE GH2 STORAGE VESSEL | 6 |
| 6. | GH2 PRIORITY VALVE PANEL | 1 |
| 7. | AIR COMPRESSOR | 1 |
| 8. | PRE-DISPENSING CHILLER | 2 |
| 9. | GH2 DISPENSER | 2 |
| 10. | MAIN SERVICE PANELBOARD | 1 |
| 11. | MOTOR STARTED PANELBOARD FOR PUMPS | 1 DUPLEX |
| 12. | SYSTEM CONTROL PANEL | 1 |


Stantec
Stantec Proj No. 2073016390
MAINTENANCE BUILDING
FUELING STATION
ADMIN/ OPER. BLDG.
BUS WASH
BUS PARKING
PARATRANSIT PARKING
BEB CHARGING AREA (SEE ENLARGED PLAN)
EXISTING MAIN ELECTRICAL SERVICE
EXISTING PG&E TRANSFORMER
NEW CONCRETE PULLBOX 'A' (BY OTHERS)
NEW DIRECTIONAL BORED CONDUIT (BY OTHERS)
EXISTING SOLAR CANOPY
NEW DIRECTIONAL BORED CONDUITS (BY OTHERS)
NEW CONCRETE VAULT 'B' (BY OTHERS)
NEW 480V PANELBOARD FOR BUS CHARGING EQUIPMENT
NEW EQUIPMENT TO BE PROTECTED W/ 6" BOLLARDS ALL AROUND
CHARGER EQUIPMENT YARD FOR (4) CHARGERS PLUS FUTURE EXPANSION (REMOVES THREE PARATRANSIT PARKING STALLS)
EDGE OF EXISTING PAVEMENT
NOTES:
1. EXACT ROUTING OF SITE CONDUITS AND EQUIPMENT LOCATIONS TO BE CLOSELY COORDINATED WITH EXISTING CONDITIONS. LAYOUT SHOWN IS CONCEPTUAL AND FOR PLANNING PURPOSES ONLY.
2. REFER TO ELECTRICAL SINGLE LINE FOR ADDITIONAL INFORMATION.
3. PROPOSED LAYOUT REMOTELY LOCATES CHARGING EQUIPMENT FROM PARKING AREA SERVED TO MINIMIZE IMPACTS TO BUS OPERATIONS.
4. DISPENSERS SHOULD BE APPROXIMATELY 300' OF CABLE DISTANCE FROM CHARGER CABINET TO STAY WITHIN STANDARD COMMUNICATION CABLING LIMITATIONS.
BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 1: MAJORITY BEB FLEET
CONCEPTUAL BEB CHARGING SITE PLAN
DATE: 02/09/22
DWG:
1.3

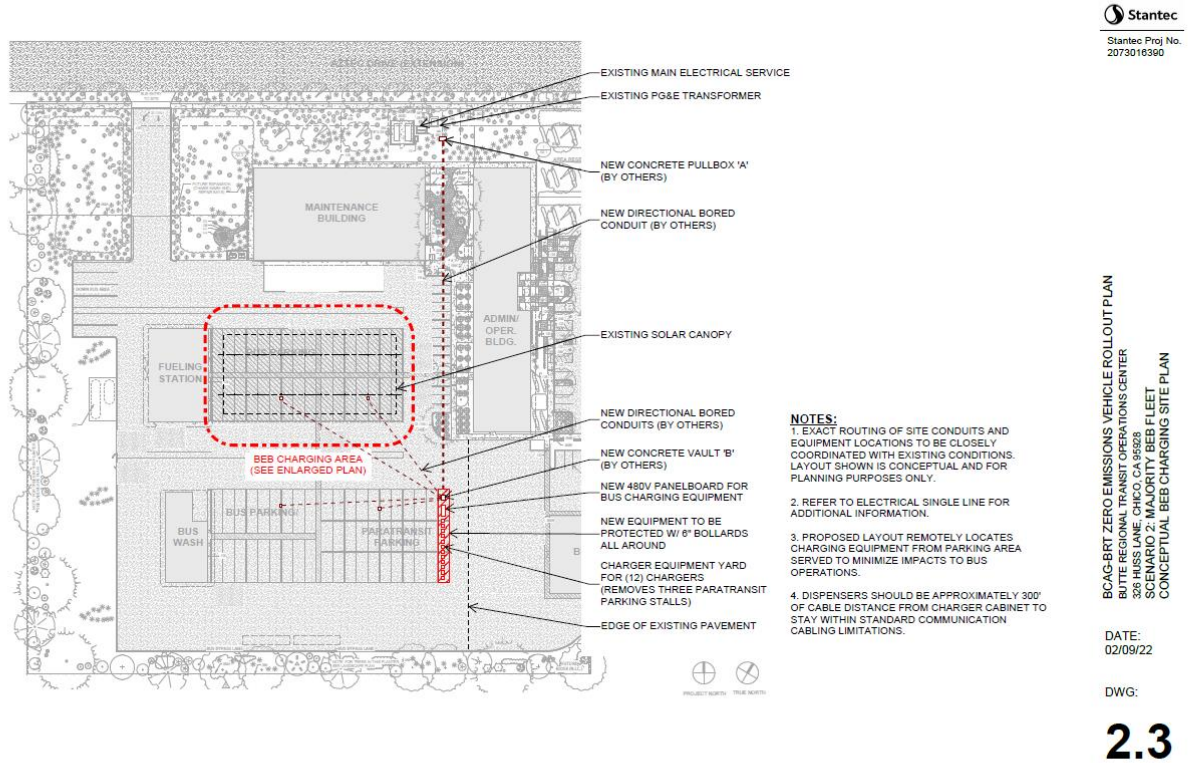

Stantec
Stantec Proj No. 2073016390
2'-0"
PEDESTAL MOUNTED DUAL CABLE DISPENSER (SERVES UP TO 2 BUSES)
(4) BOLLARDS AT EACH DISPENSER
NEW PAINT STRIPING TO NARROW WIDTH OF PARKING STALLS
EXISTING PARKING STALL PAINT STRIPING
EXISTING WALK AISLE TO REMAIN
EXISTING CANOPY COLUMNS
EDGE OF EXISTING SOLAR CANOPY ABOVE
EXISTING FUELING BUILDING
UNDERGROUND CONDUITS TO EACH DISPENSER LOCATION
IN-GROUND PULLBOX 'C' (BY OTHERS)
CONDUITS TO CHARGER EQUIPMENT YARD VAULT (BY OTHERS), SEE OVERALL SITE PLAN
NOTES:
1. LAYOUT FOR (8) BEB'S SERVED BY (4) CHARGERS. EACH CHARGER SERVES TWO DISPENSERS.
2. LAYOUT ASSUMES CHARGER PORTS ON BUSES ARE AT BOTH SIDES OF REAR OF BUSES AND ALL BUSES WILL BE PARKED FACING IN THE SAME DIRECTION DURING CHARGING PERIODS.
3. ADDITIONAL DISPENSER LOCATION FLEXIBILITY IS POSSIBLE IF VEHICLES ARE PROCURED WITH CHARGER PORTS AT CURB-SIDE REAR AND STREET-SIDE FRONT WHICH WILL ALLOW FOR BUSES TO PARK IN EITHER DIRECTION AND STILL HAVE ACCESS TO DISPENSERS.
4. CHARGERS ARE REMOTELY LOCATED, SEE OVERALL SITE PLAN.
BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 1: MAJORITY BEB FLEET
CONCEPTUAL BEB CHARGING ENLARGED PLAN
DATE:
02/09/22
DWG:
1.4


Stantec
Stantec Proj No. 2073016390
HYDROGEN DEMAND
ACTIVE NUMBER OF H2 FCEB VEHICLES (40' / CUTAWAY) 8 / 4
TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKDAY) [KG] 243
TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKDAY) [GAL] 907
TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKEND) [KG] 94
TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKEND) [GAL] 351
STORAGE TANK CAPACITY - NOMINAL [GAL] 9,000
STORAGE TANK CAPACITY - 90% USABLE [GAL] 8,100
QTY OF LH2 STORAGE TANKS 1
STORAGE LAST (WEEKDAY) [DAYS] 8
FREQUENCY OF FILLING STORAGE PER WEEK 0.65
FREQUENCY OF FILLING STORAGE DELIVERED BY OFFLOADING TRUCK FOR WEEKDAY CONSUMPTION ONE FUEL DELIVERY EVERY 10 DAYS
BUS ENTRY
EXISTING FUELING BUILDING
BUS EXIT
HYDROGEN FUELING EQUIPMENT COMPOUND (SEE ENLARGED PLAN)
MAINTENANCE BUILDING
ADMIN/ OPER. BLDG.
BUS WASH
(E) BUILDING (N.I.C.)
NOTES:
1. HYDROGEN DISPENSERS MAY BE LOCATED IN EXISTING FUELING STATION. DISPENSERS SHOULD BE LOCATED IN AN OPEN-AIR LOCATION. DETAILS WILL BE STUDIED IN DESIGN PHASE FOR BEST LOCATION.
2. PER ABOVE TABLE, 8 (40-FT) BUSES AND 4 CUTAWAYS ARE CONSIDERED FOR CALCULATING STORAGE AND FREQUENCY OF DELIVERY.
3. PER ABOVE TABLE A 9,000 GAL STORAGE TANK WILL LAST ABOUT 8 DAYS PER WEEKDAY CONSUMPTION.
4. CONSIDERING LESS FUEL CONSUMPTION OVER WEEKENDS, ONE FUEL DELIVERY WOULD BE NEEDED EVERY 10 WEEKDAYS.
BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 2: MAJORITY BEB FLEET
CONCEPTUAL LIQUIFIED HYDROGEN SYSTEM SITE PLAN
DATE: 02/09/22
DWG:
2.1




**PRELIMINARY EQUIPMENT SCHEDULE**

| MARK # | ITEM | QTY |
|---|---|---|
| 1. | LIQUIFIED HYDROGEN TANK | 1 |
| 2. | RECIPROCATING LH2 PUMPS | 1 |
| 3. | HYDROGEN VAPORIZER | 1 |
| 4. | SUPERHEATER VAPORIZER | 1 |
| 5. | HIGH-PRESSURE GH2 STORAGE VESSEL | 1 |
| 6. | GH2 PRIORITY VALVE PANEL | 1 |
| 7. | AIR COMPRESSOR | 1 |
| 8. | PRE-DISPENSING CHILLER | 1 |
| 9. | GH2 DISPENSER | 1 |
| 10. | MAIN SERVICE PANELBOARD | 1 |
| 11. | MOTOR STARTED PANELBOARD FOR PUMPS | 1 SIMPLEX |
| 12. | SYSTEM CONTROL PANEL | 1 |



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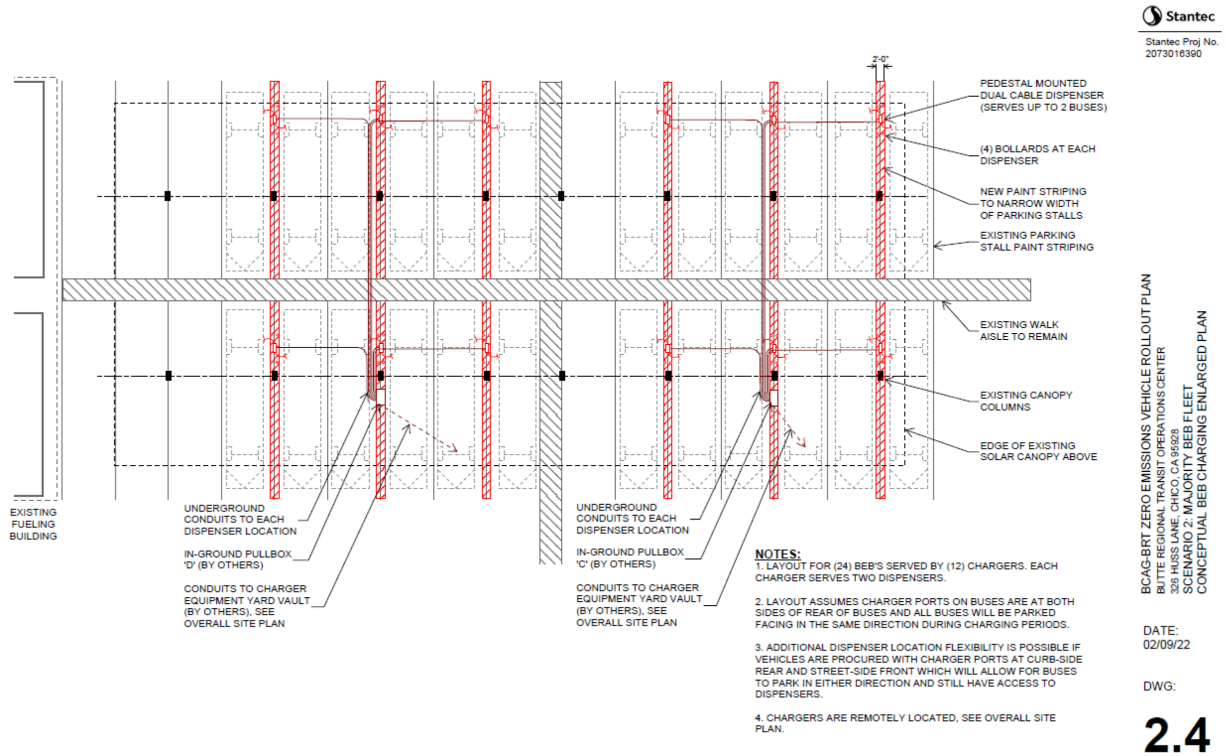
Stantec Proj No. 2073016390
MAINTENANCE BUILDING
ADMIN/ OPER. BLDG.
FUELING STATION
BUS WASH
BUS PARKING
PARATRANSIT PARKING
BEB CHARGING AREA (SEE ENLARGED PLAN)
EXISTING MAIN ELECTRICAL SERVICE
EXISTING PG&E TRANSFORMER
NEW CONCRETE PULLBOX 'A' (BY OTHERS)
NEW DIRECTIONAL BORED CONDUIT (BY OTHERS)
EXISTING SOLAR CANOPY
NEW DIRECTIONAL BORED CONDUITS (BY OTHERS)
NEW CONCRETE VAULT 'B' (BY OTHERS)
NEW 480V PANELBOARD FOR BUS CHARGING EQUIPMENT
NEW EQUIPMENT TO BE PROTECTED W/ 6" BOLLARDS ALL AROUND
CHARGER EQUIPMENT YARD FOR (12) CHARGERS (REMOVES THREE PARATRANSIT PARKING STALLS)
EDGE OF EXISTING PAVEMENT
NOTES:
1. EXACT ROUTING OF SITE CONDUITS AND EQUIPMENT LOCATIONS TO BE CLOSELY COORDINATED WITH EXISTING CONDITIONS. LAYOUT SHOWN IS CONCEPTUAL AND FOR PLANNING PURPOSES ONLY.
2. REFER TO ELECTRICAL SINGLE LINE FOR ADDITIONAL INFORMATION.
3. PROPOSED LAYOUT REMOTELY LOCATES CHARGING EQUIPMENT FROM PARKING AREA SERVED TO MINIMIZE IMPACTS TO BUS OPERATIONS.
4. DISPENSERS SHOULD BE APPROXIMATELY 300' OF CABLE DISTANCE FROM CHARGER CABINET TO STAY WITHIN STANDARD COMMUNICATION CABLING LIMITATIONS.
BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 2: MAJORITY BEB FLEET
CONCEPTUAL BEB CHARGING SITE PLAN
DATE: 02/09/22
DWG:
2.3


Stantec
Stantec Proj No.
2073016390
2'-0"
PEDESTAL MOUNTED DUAL CABLE DISPENSER (SERVES UP TO 2 BUSES)
(4) BOLLARDS AT EACH DISPENSER
NEW PAINT STRIPING TO NARROW WIDTH OF PARKING STALLS
EXISTING PARKING STALL PAINT STRIPING
EXISTING WALK AISLE TO REMAIN
EXISTING CANOPY COLUMNS
EDGE OF EXISTING SOLAR CANOPY ABOVE
EXISTING FUELING BUILDING
UNDERGROUND CONDUITS TO EACH DISPENSER LOCATION
IN-GROUND PULLBOX 'D' (BY OTHERS)
CONDUITS TO CHARGER EQUIPMENT YARD VAULT (BY OTHERS), SEE OVERALL SITE PLAN
UNDERGROUND CONDUITS TO EACH DISPENSER LOCATION
IN-GROUND PULLBOX 'C' (BY OTHERS)
CONDUITS TO CHARGER EQUIPMENT YARD VAULT (BY OTHERS), SEE OVERALL SITE PLAN
NOTES:
1. LAYOUT FOR (24) BEB'S SERVED BY (12) CHARGERS. EACH CHARGER SERVES TWO DISPENSERS.
2. LAYOUT ASSUMES CHARGER PORTS ON BUSES ARE AT BOTH SIDES OF REAR OF BUSES AND ALL BUSES WILL BE PARKED FACING IN THE SAME DIRECTION DURING CHARGING PERIODS.
3. ADDITIONAL DISPENSER LOCATION FLEXIBILITY IS POSSIBLE IF VEHICLES ARE PROCURED WITH CHARGER PORTS AT CURB-SIDE REAR AND STREET-SIDE FRONT WHICH WILL ALLOW FOR BUSES TO PARK IN EITHER DIRECTION AND STILL HAVE ACCESS TO DISPENSERS.
4. CHARGERS ARE REMOTELY LOCATED, SEE OVERALL SITE PLAN.
BCAG-BRT ZERO EMISSIONS VEHICLE ROLLOUT PLAN
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
326 HUSS LANE, CHICO, CA 95928
SCENARIO 2: MAJORITY BEB FLEET
CONCEPTUAL BEB CHARGING ENLARGED PLAN
DATE:
02/09/22
DWG:
2.4

# Zero-Emission Bus Rollout Plan

Prepared by Center for Transportation and the Environment

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# List of Abbreviations

3R: Redundancy, Resilience, and Emergency Response

ADA: Americans with Disabilities Act

A&E: Architecture and Engineering

ACTC: Alameda County Transportation Commission

BCAG: Butte County Association of Governments

BEB: Battery Electric Bus

CA: California

CARB: California Air Resources Board

CNG: Compressed Natural Gas

COVID/COVID-19: Coronavirus Disease 2019 (SARS-CoV-2)

CTE: Center for Transportation and the Environment

DAC: Disadvantaged Community

FCEB: Fuel Cell Electric Bus

HVAC: Heating, Ventilation, and Air Conditioning

ICE: Internal Combustion Engine

ICT: Innovative Clean Transit

kW: Kilowatt

kWh: Kilowatt-Hour

MV: MV Transportation

MW: Megawatt

OEM: Original Equipment Manufacturer

OET: Operator Excellence Training

PM: Particulate Matter

PPI: Producer Price Index

RCNG: Renewable Compressed Natural Gas

RFP: Request for Proposals

SCE: Southern California Edison (SoCal Edison)

TDA: Transportation Development Act

VTT: Verification of Transit Training

ZEB: Zero-Emission Bus

A glossary of useful terms can also be found in Appendix C - Glossary

# Executive Summary

B-Line provides regional and local public transit services in Butte County and covers roughly 700 square miles of service area. The current bus fleet consists of 29 fixed-route buses: 29 diesel buses (11 35-foot diesel and 18 40-foot diesel buses). B-Line also operates 2 types of paratransit services—ADA Paratransit and Dial-A-Ride. Their paratransit fleet consists of 22 gasoline-powered cutaway vehicles (28-feet). Butte County Association of Governments (BCAG) engaged the Center for Transportation and the Environment (CTE) to perform a zero-emission bus (ZEB) transition study to create a plan for a 100% zero-emission fleet by 2040 to comply with the Innovative Clean Transit (ICT) regulation enacted by the California Air Resources Board (CARB).

BCAG's Rollout Plan achieves a zero-emission bus fleet in line with the 2040 target of the ICT Regulation. To achieve this goal, B-Line will replace all 35' and larger ICE buses with ZEBs when the vehicles reach the end of their 12-year useful life. By 2040, 24 of the agency's buses are expected to be BEBs and 8 will be FCEBs. The last of the agency's ICE buses will reach end of life in 2039. Four of B-Line's cutaways will also be transitioned to fuel cell electric cutaways. The remaining cutaways will remain gasoline vehicles as there is not currently a zero-emission vehicle on the market that has received a Bus Resting Report that can meet the service requirements of B-Line's paratransit service based on CTE's analysis.[1]

All of B-Line's services operate out of a single operations, maintenance, and administrative facility at 326 Huss Dr. Chico, CA 95928. BCAG plans to install both charging and hydrogen fueling infrastructure at this location to support their mixed fleet. BCAG also explored redundancy, resilience and emergency response options related to fueling in the event that B-Line would be expected to provide service during an emergency or power outage.

B-Line's bus service provides transportation opportunities to numerous Disadvantaged Communities (DACs) and moving toward zero-emission buses will help improve the health of DACs and non-DACs alike. The agency will build upon an existing training structure for bus maintenance and operators to provide the necessary battery-electric bus (BEB) and fuel cell electric bus (FCEB) specific training that will be required for the agency to own and operate BEBs and FCEBs. The agency estimates that pursuing a ZEB fleet in place of an internal combustion engine (ICE) fleet will cost an additional $27M in bus costs and infrastructure alone between 2021 and 2040, which will require significantly more funding opportunities. BCAG plans to pursue funding opportunities at the federal, state, and local levels to help fill this funding gap.

[1] This is allowable under the ICT regulation which states that "Purchases of cutaway, over-the-road, double- decker, or articulated buses are subject to the zero-emission bus purchase requirements as specified in section 2023.1(a) on or after January 1, 2026, if the cutaway, over-the-road, double-decker, or articulated bus type has a model that has passed the bus testing procedure and obtained a Bus Testing Report as described in section 2023(b)(8) for a given weight class."

# A

# Transit Agency Information

## BCAG Profile

### History

In June 2005, B-Line was formed in order to consolidate transit systems previously operated by the County of Butte (Butte County Transit), the City of Chico (Chico Area Transit), the City of Oroville (Oroville Area Transit) and the Town of Paradise. B-Line service is delivered by a contract transit operator, Transdev, Inc., which also performs dispatching and maintenance duties at the Butte Regional Operations Center (BROC) in the City of Chico.

BCAG is the Regional Transportation Planning Agency (RTPA) and Metropolitan Planning Organization (MPO) for Butte County, as designated by the Secretary of the Business Transportation & Housing Agency for the State of California. Through the BCAG Joint Powers Agreement, the BCAG Board also serves as the administrative and policymaking agency for B-Line allowing for better routes, a uniform fare structure, improved service with timed transfers, consistent headways for ease of use, and comprehensive customer service.[2]

### Service Area and Bus Service

B-Line provides regional and local public transit services in Butte County and covers roughly 700 square miles. The current bus fleet consists of 29 fixed-route buses: 29 diesel buses (11 35-foot diesel and 18 40-foot diesel buses).

B-Line operates 21 fixed routes, which includes 5 regional routes, 15 local routes, and an express route to Chico Airport. Regional routes connect the towns and cities of Chico, Oroville, Paradise, Magalia, Gridley, and Biggs. Local routes serve the Chico urban area and the city of Oroville. The average speed of the regional routes is 28.9 mph. For local routes, the average speed is 15 mph. The average speed for the express route is 17.3 mph.

B-Line also operates 2 types of paratransit services—ADA Paratransit and Dial-A-Ride. Their paratransit fleet consists of 22 gasoline-powered cutaway vehicles (28-feet).

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[2] BCAG Unmet Transit Needs Assessment – 2021/2022 http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf

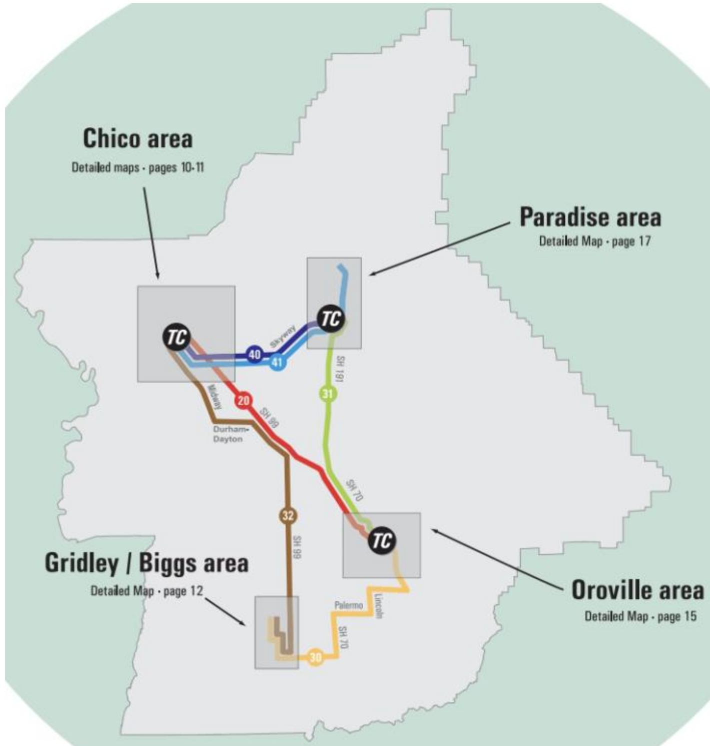


*Figure 1 - BCAG Service Area*

## Ridership

B-Line serves a diverse community, with a large portion of its daily passengers being individuals without cars (by choice or because of financial limitation), university students, and paratransit riders. Although ridership on transit in general has been decreasing over the past few years due in part to lower gas prices and more affordable automobiles, which has allowed more people the opportunity to own personal cars, the ridership reductions seen by B-Line in recent years are more directly tied to reduced population in its service area following the Camp Fire.[3] In 2018, the Camp Fire burned through Butte County and destroyed homes and businesses in the town of Paradise, which is served by B-Line. In 2020, B-Line's service was further reduced by the Coronavirus Disease 2019 SARS-CoV-2 (COVID/COVID-19) pandemic.

B-Line's service experienced significant reduction after the 2018 Camp Fire and has not returned to its original service levels and is not expected to. Since the beginning of the COVID-19 pandemic, the services have stayed the same with the exception of Route 40 and 41, which runs through areas affected by the Camp Fire—demand for bus service in Paradise has remained low. Based on BCAG's data of available ridership and total fares received from July 2018 through the month of June 2019 (pre-COVID levels), there were 949,871 fixed-route passengers and 141,277 paratransit passengers.[4] BCAG anticipates annual ridership to be less than this over the next 5 years. In response to the changing ridership needs, due in part to the Camp Fire and COVID, BCAG is conducting a Route Optimization Study, which will be completed in the Summer of 2023 in order to re-assess how to most efficiently serve individual routes as well as the whole system.

[3] Grengs, Joe; Levine, Jonathan; and Shen, Qingyun. (2013). Evaluating transportation equity: An inter-metropolitan comparison of regional accessibility and urban form. FTA Report No. 0066. For the Federal Transit Administration

[4] Page 21 of BCAG's Unmet Transit Needs Assessment – 2021/2022 http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf

## BCAG Basic Information

**Transit Agency's Name:**

Butte Regional Transit

**Mailing Address:**

Butte County Association of Governments

326 Huss Dr. Suite 150

Chico, CA 95928

**Transit Agency's Air Districts:**

BCAG is part of the Butte County Air Quality Management District.

**Transit Agency's Air Basin:**

Butte County Air Quality Management District is part of the Sacramento Valley Air Basin District.[5]

**Total number of buses in Annual Maximum Service:**

The maximum number of active buses operating fixed-route service out of the Butte Regional Operations Center is 32. B-Line also operates 22 gas cutaway vehicles in support of dial-a ride and paratransit service.

**Urbanized Area:**

Chico, CA. Chico is 28 square miles of land area with 2,161 people per square mile living within that area.

**Population of Urbanized Area:**

101,475 people

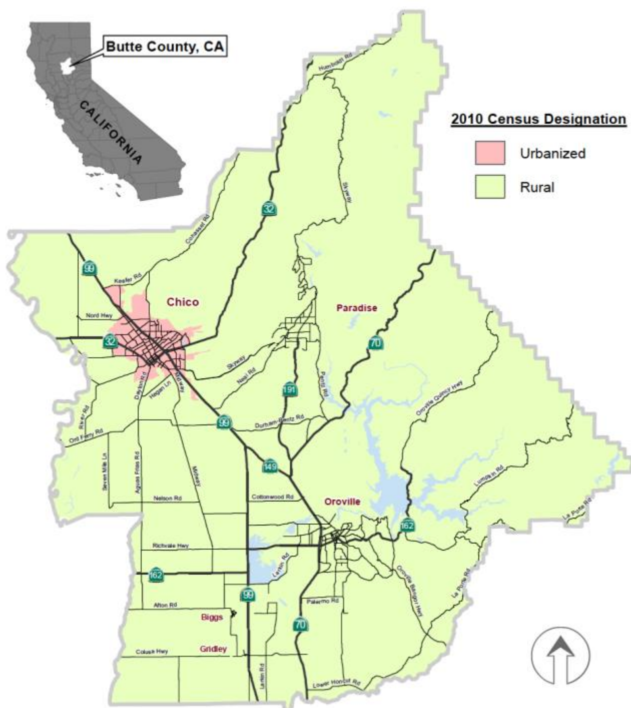


*Figure 2 - Butte County Urbanized and Rural Map*

**Contact Information for Inquiries on the BCAG ICT Rollout Plan:**

Andy Newsum, Deputy Director, Butte County Association of Governments

[5] https://www.airquality.org/Meetings/Sacramento-Valley-Basinwide-Air-Pollution-Control-Council

326 Huss Drive, Suite 150
Chico, CA 95928
Tel: (530) 809-4616
ANewsum@bcag.org

**Is your transit agency part of a Joint Group?** No

## Fleet Facility

BCAG currently has one maintenance facility, located at 326 Huss Ln, Chico, CA 95928 as shown in **Figure 3.**

*Figure 3 - Butte Regional Operations Center*

## BCAG's Sustainability Goals

Butte County Association of Governments (BCAG) has developed a plan to transition to a fully zero emission bus (ZEB) fleet composed of battery electric and fuel cell electric buses by 2040, in accordance with the Innovative Clean Transit (ICT) regulation, requiring all California transit agencies to follow zero-emission procurement guidelines with the goal of achieving 100% zero-emission fleets by 2040. BCAG has committed to purchasing zero emission buses, demonstrating the agency's commitment to reducing emissions. BCAG has worked with CTE to select a plan that prioritizes B-Line's local needs and conditions, namely considering resilience, redundancy, and emergency response adaptation options. B-Line's transition to a fully ZEB fleet will ultimately benefit communities through cleaner air, greater independence from fossil fuels, and more environmental sustainability.

# B

# Rollout Plan General Information

## Overview of the Innovative Clean Transit Regulation

On December 14, 2018, CARB enacted the Innovative Clean Transit (ICT) regulation, setting a goal for California public transit agencies to have zero-emission bus fleets by 2040. The regulation specifies the percentage of new bus procurements that must be zero-emission buses for each year of the transition period (2023–2040). The annual percentages for Small Transit agencies are as follows:

ICT Zero-Emission Bus Purchase Requirements for Small Agencies:

**January 1, 2026** - 25% of all new bus purchases must be zero-emission

**January 1, 2027** - 25% of all new bus purchases must be zero-emission

**January 1, 2028** - 25% of all new bus purchases must be zero-emission

**January 1, 2029+** - 100% of all new bus purchases must be zero-emission

**March 2021-March 2050** – Annual compliance report due to CARB

This purchasing schedule guides agency procurements to realize the goal of zero-emission fleets in 2040 while avoiding any early retirement of vehicles that have not reached the end of their 12-year useful life. Agencies have the opportunity to request waivers that allow purchase deferrals in the event of economic hardship or if zero-emission technology cannot meet the service requirements of a given route. These concessions recognize that zero-emission technologies may cost more than current internal combustion engine (ICE) technologies on a vehicle lifecycle basis and that zero-emission technology may not currently be able to meet all service requirements.

## BCAG's Rollout Plan General Information

Rollout Plan's Approval Date: August 25, 2022

Resolution No: See **Appendix A – Approved Board Resolution.**

Is a copy of the approved resolution attached to the Rollout Plan?
Yes, please see **Appendix A – Approved Board Resolution.**

**Contact for Rollout Plan follow-up questions:**
Andy Newsum, *Deputy Director*, Butte County Association of Governments

326 Huss Drive, Suite 150

Chico, CA 95928

Tel: (530) 809-4616

ANewsum@bcag.org

**Who created the Rollout Plan?**
This Rollout Plan was created by BCAG, with assistance from the Center for Transportation and the Environment (CTE).

BCAG created their ICT Rollout Plan in combination with a Zero-Emission Bus Transition Master Plan, which explains BCAG's plans for transition in greater detail. The Master Plan will be maintained and updated annually. As a result of CTE's fleet transition planning methodology described herein and in greater detail in the Master Plan, BCAG decided to pursue a zero-emission fleet comprised of 75% BEBs and 25% fuel cell electric buses (FCEB). BCAG's fleet transition strategy is to replace each ICE bus with a BEB as they reach the end of their useful life. In 2030, however, rather than replacing all 13 buses that have reached the end of their useful life with BEBs, BCAG plans to procure 8 FCEBs in addition to 5 BEBs, thus resulting in a mixed fleet.

This document, the ICT Rollout Plan, contains the information for BCAG's zero-emission fleet transition trajectory as requested by the ICT Regulation. It is intended to outline the high-level plan for implementing of the transition. The Rollout Plan provides estimated timelines based on information on bus purchases, infrastructure upgrades, workforce training, and other developments and expenses that were available at the time of writing. BCAG may update the Rollout Plan as needed as the industry continues to develop and as the Master Plan is updated.

## Additional Agency Resources

BCAG agency website: [http://www.bcag.org/index.html](http://www.bcag.org/index.html)

# C

# Technology Portfolio

## ZEB Transition Technology Selection

BCAG has elected to pursue a BEB Majority Mixed Fleet comprised of 75% BEBs and 25% FCEBs for their 35' and 40' buses and a 20% FCEV cutaway fleet. The bus fleet is projected to be 100% zero-emission in 2040 with a cutaway fleet that is 20% zero-emission, which results in a 66.7% zero-emission fleet overall. As detailed below, BCAG explored four possible ZEB transition scenarios: BEB Only, two Mixed Fleet scenarios (one 75% BEB & one 75% FCEB), and FCEB Only. BCAG decided against a BEB Only or FCEB Only fleet to avoid being tied to a single fuel technology. BCAG's chosen BEB Majority Mixed Fleet scenario allows the agency to rely primarily on the more mature and relatively less expensive BEB technology for a majority of their fleet, while benefiting from the resilience and redundancy that is provided by having a portion of the fleet transition to FCEBs.

### Local Developments and Regional Market

California has become a global leader for zero-emission buses, as well as the zero-emission fuel and fueling infrastructure required to support these vehicles. California is home to four bus OEMs that manufacture zero-emission buses. Although three of these OEMs do not currently build FCEBs, growing demand for this vehicle technology may encourage these manufacturers to enter the market.

The state legislature has fostered growth in zero-emission fuels through the state's Low-Carbon Fuel Standard (LCFS) program, which incentivizes the consumption of fuels with a lower carbon intensity than traditional combustion fuels and through funding opportunities offered by CARB and CEC. The state's electrical utility companies have also supported the transition to ZEB technology by offering incentive programs for heavy duty EV charging infrastructure and service upgrades. California BEB deployments represent 37% of the nation's BEB deployments. [6]

California also has one of the most mature hydrogen fueling networks in the nation. The state's hydrogen market has developed to support the growing number of fuel cell electric vehicles on the roads in the state. California has four medium-and-heavy-duty fueling stations in operation and four more in development. Additionally, the number of hydrogen production and distribution centers is growing to meet increased hydrogen demand as it gains popularity as a transportation fuel. California FCEB deployments represent 75% of the nation's FCEB deployments.[7]

## ZEB Transition Planning Methodology

BCAG's ICT Rollout Plan was created in combination with BCAG's ZEB Transition Master Plan, utilizing CTE's ZEB Transition Planning Methodology. CTE's methodology consists of a series of assessments that enable transit agencies to understand what resources and decisions are necessary to convert their fleets to zero-emission technologies. The results of the assessments help the agency decide on a step-by-step process to achieve its transition goals. These assessments consist of data collection, analysis, and modeling outcome reporting stages. These stages are sequential and build upon findings in previous steps. The assessment steps specific to BCAG's Rollout Plan are outlined below:

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[6] CALSTART. 2021. THE ADVANCED TECHNOLOGY TRANSIT BUS INDEX: A NORTH AMERICAN ZEB INVENTORY REPORT. https://calstart.org/wp-content/uploads/2022/01/2021-ZIO-ZEB-Final-Report_1.3.21.pdf

[7] CALSTART. 2021. THE ADVANCED TECHNOLOGY TRANSIT BUS INDEX: A NORTH AMERICAN ZEB INVENTORY REPORT. https://calstart.org/wp-content/uploads/2022/01/2021-ZIO-ZEB-Final-Report_1.3.21.pdf

1. Planning and Initiation
2. Requirements Analysis & Data Collection
3. Service Assessment
4. Fleet Assessment
5. Fuel Assessment
6. Facilities Assessment
7. Maintenance Assessment
8. Total Cost of Ownership Assessment

For **Requirements Analysis & Data Collection**, CTE collects data on the agency's fleet, routes and blocks, operational data (e.g., mileage and fuel consumption), and maintenance costs. Using this data, CTE establishes service requirements to constrain the analyses in later assessments and produce agency-specific outputs for the zero-emission fleet transition plan.

The **Service Assessment** phase initiates the technical analysis phase of the study. Using information collected in the Data Collection phase, CTE evaluates the feasibility of using zero-emission buses to provide service to the agency's routes and blocks over the transition plan timeframe from 2021 to 2040. Results from the Service Assessment are used to guide ZEB procurement plans in the Fleet Assessment and to determine energy requirements in the Fuel Assessment.

The **Fleet Assessment** projects a timeline for the replacement of existing buses with ZEBs that is consistent with BCAG's existing fleet replacement plan and known procurements. This assessment also includes a projection of fleet capital costs over the transition timeline and is optimized to meet state mandates or agency goals, such as minimizing costs or maximizing service levels.

The **Fuel Assessment** merges the results of the Service Assessment and Fleet Assessment to determine annual fuel requirements and associated costs. The Fuel Assessment calculates energy costs through the full transition timeline for each fleet scenario, including the agency's existing ICE buses. To more accurately estimate battery electric bus (BEB) charging costs, a focused Charging Analysis is performed to simulate daily system-wide energy use. As older technologies are phased out in later years of the transition, the Fuel Assessment calculates the changing fuel requirements as the fleet transitions to ZEBs. The Fuel Assessment also provides a total fuel cost over the transition timeline.

The **Facilities Assessment** determines the infrastructure necessary to support the projected zero-emission fleet composition over the transition period based on results from the Fleet Assessment and Fuel Assessment. This assessment evaluates the required quantities of charging infrastructure and/or hydrogen fueling station projects and calculates the costs of infrastructure procurement and installation sequenced over the transition timeline.

The **Maintenance Assessment** calculates all projected fleet maintenance costs over the transition timeline. Maintenance costs are calculated for each fleet scenario and include costs of maintaining existing fossil-fuel buses that remain in the fleet and maintenance costs of new BEBs and FCEBs.

The **Total Cost of Ownership Assessment** compiles results from the previous assessment stages to provide a comprehensive view of all fleet transition costs, organized by scenario, over the transition timeline.

## Requirements Analysis & Data Collection

The Requirements Analysis and Data Collection stage begins by compiling operational data from BCAG regarding its current fleet and operations and establishing service requirements to constrain the analyses in later assessments. CTE requested data such as fleet composition, fuel consumption and cost, maintenance costs, and annual mileage from B-Line to use as the basis for analyses. CTE also collected GPS data from a representative sample of B-Line's routes, which was used as the basis for modelling energy efficiencies for BEBs operating in B-Line's service area. The calculated efficiencies were then used in the Service Assessment to determine the energy requirements of B-Line 's service.

CTE evaluated BEBs and FCEBs in B-Line 's service to support BCAG's technology selection. The range of FCEBs, however, does not have the same level of sensitivity to environmental and operating conditions as BEBs. After collecting route and operational data, CTE determined that B-Line 's longest block is 225 miles long. Based on observed performance, CTE estimates FCEBs are able to complete any block under 350 total miles, which means that FCEB technology already has the capability to meet B-Line 's service requirements. Although FCEBs were determined to have the capability of serving all of B-Line's routes, BCAG was interested in exploring BEB Only and Mixed Fleet scenarios as well, so it was necessary to determine how much of B-Line's service could feasibly be served by depot-only charged BEBs in order to develop a set of ZEB transition scenarios that would allow the agency to make an informed decision on what technology or technologies would be most suitable to the agency's needs.

The energy efficiency and range of BEBs are primarily driven by bus specifications, such as on-board energy storage capacity and vehicle weight. Both metrics are affected by environmental and operating variables including the route profile (e.g., distance, dwell time, acceleration, sustained top speed over distance, average speed, and traffic conditions), topography (e.g., grades), climate (e.g., temperature), driver behavior, and operational conditions such as passenger loads and auxiliary loads. As such, BEB efficiency and range can vary dramatically from one agency to another or even from one service day to another. It was therefore critical for BCAG to determine efficiency and range estimates based on an accurate representation of its operating conditions.

To understand BEB performance on B-Line's routes, CTE modeled the impact of variations in passenger load, accessory load, and battery degradation on bus performance, fuel efficiency, and range. CTE ran models with different energy demands that represented *nominal* and *strenuous* conditions. Nominal loading conditions assume average passenger loads and moderate temperature over the course of the day, which places low demands on the motor and heating, ventilation, and air conditioning (HVAC) system. Strenuous loading conditions assume high or maximum passenger loading and near maximum output of the HVAC system. This nominal/strenuous approach offers a range of operating efficiencies to use for estimating average annual energy use (nominal) or planning minimum service demands (strenuous). Route modeling ultimately provides an average energy use per mile (kilowatt-hour/mile [kWh/mi]) for each route, bus size, and load case.

In addition to loading conditions, CTE modeled the impact of battery degradation on a BEB's ability to complete a block. The range of a battery electric bus is reduced over time due to battery degradation. A BEB may be able to service a given block with beginning-of-life batteries, while later it may be unable to complete the entire block at some point in the future as batteries near their end-of-life or derated capacity (typically considered 70-80% of available service energy).

## Service Assessment

Given the conclusion that FCEBs could meet the range requirements for B-Line's service, the Service Assessment focused on evaluating the feasibility of BEBs in B-Line's service area. The efficiencies calculated in the Requirements Analysis & Data Collection stage were used to estimate the energy requirements of B-Line's service. The main focus of the Service Assessment is called the block analysis, which determines if generic battery electric technology can meet the service requirements of a block based on range limitations, weather conditions, levels of battery degradation and route specific requirements. The Transit Research Board's Transit Cooperative Research Program defines a block as "the work assignment for only a single vehicle for a single service workday".[8] A block is usually comprised of several trips on various routes. The energy needed to complete a block is compared to the available energy of the bus assigned to service the block. If the bus's usable onboard energy exceeds the energy required by the block, then the conclusion is that the BEB can successfully operate on that block.

The Service Assessment projects the performance of a BEB that is charged overnight at the depot and operates on BCAG's service schedule at the time of the plan's writing. The results are used to determine when along the transition timeline a fleet of overnight depot-charged BEBs can feasibly serve B-Line 's territory or if another zero-emission technology is required to maintain service. This information can then be used to inform the scale and timing of BEB procurements in the Fleet Assessment.

## Modeling & Procurement Assumptions

CTE and BCAG defined the following assumptions and requirements used throughout the study:

The Service Assessment energy profile assumed a 5% improvement in battery capacity every year with a starting battery capacity of 440 kWh for 35' and 40' buses, which was the average battery capacity seen in commercially-available buses in 2021. Electric cutaways are modeled to have a battery capacity of 110 kWh and were assumed to have the same 5% rate of improvement in battery capacity every year.

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[8] TRB's Transit Cooperative Research Program. 2014. TCRP Report 30: Transit Scheduling: Basic and Advanced Manuals (Part B). https://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_30-b.pdf

This analysis also assumed B-Line will maintain blocks in a similar distribution of distance, relative speeds, and elevation changes to pre-COVID-19 service because buses will continue to serve similar locations within the service area and general topography remains constant even if specific routes and schedules change.

Fleet size and vehicle length distribution do not change over time. The analysis assumed that buses reaching the end of their useful life would be replaced with vehicles of the same size. Total fleet size remains the same over the transition period.

Buses are assumed to operate for a 12-year service life. Cutaways are assumed to operate for a 7-year service life.

Usable on-board energy is assumed to be that of a mid-life battery (10% degraded) with a reserve at both the high and low end of the battery's charge potential. As previously discussed, battery age affects range, so a mid-life battery was assumed as the average capacity of the battery's service life. Charging batteries to 100% or dropping the charge below 10% also degrades the batteries over time, which is why the analysis assumes that the top and bottom portions of the battery are unusable.

CTE accounts for battery degradation over the transition period with the assumption that B-Line can rotate the ZEBs to battery capacity to block energy requirements. As the zero-emission fleet transition progresses, older buses can be moved to shorter, less demanding blocks and newer buses can be assigned to longer, more demanding blocks to account for battery degradation in BEBs over time. B-Line can rotate the fleet to meet demand, assuming there is a steady procurement of BEBs each year to match service requirements. CTE accounts for this variability in battery age by using a mid-life usable battery capacity to determine block feasibility.

## Results

The Service Assessment determines the timeline for when B-Line 's service may become achievable by BEBs on a single depot charge. Coupled with the FCEB range-to-block length comparison, the block analysis determines when, or if, a full transition to BEBs or FCEBs may be feasible. BCAG and CTE can then use these results to inform ZEB procurement decisions in the Fleet Assessment. Results from this analysis are also used to determine the specific energy requirements and fuel consumption of the fleet over time. These values are then used in the Fuel Assessment to estimate the costs to operate the transitioning fleet.

While routes and block schedules are unlikely to remain the same over the course of the transition period, these projections assume the blocks will maintain a similar distribution to current service because B-Line will continue to serve similar destinations within the city. This core assumption affects energy use estimates and block achievability in each year.

The results of B-Line's Service Assessment can be seen below in **Figure 4**. Based on CTE's analysis, 72% of B-Line's blocks could be served by a single charge of a depot-only BEB with a 440-kWh battery and, with the assumed 5% improvement every year, 100% of BCAG's blocks could be served by this technology by 2035, which means that all of B-Line's service is feasible with depot-only charged BEBs within the transition period.

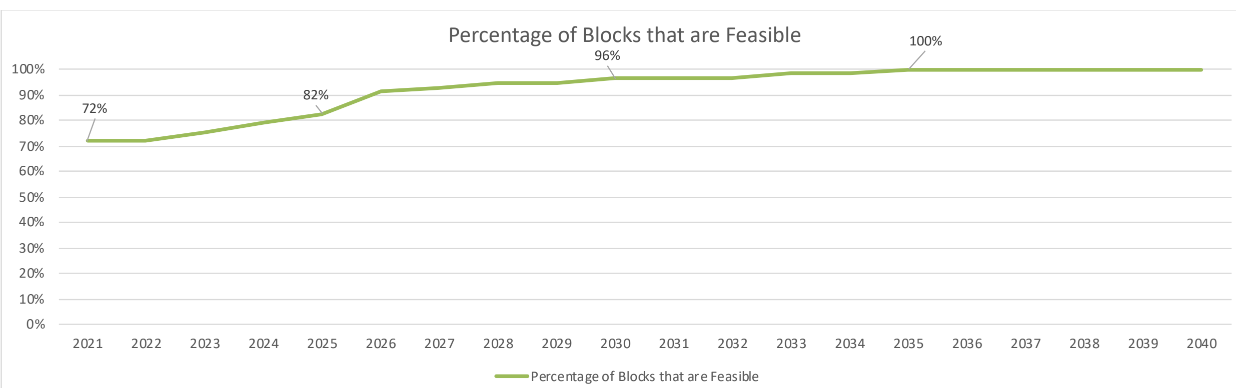


*Figure 4 - BEB Block Achievability Percentage by Year*

As noted previously, FCEBs are assumed to be able to complete any block under 350 total miles and BCAG's longest block is 225 miles long, which means that FCEB technology already has the capability to meet B-Line's service requirements.

## Cutaway Modeling

CTE's modeling also included an analysis for battery electric cutaway vehicles using B-Line's paratransit drive cycles. CTE found that the power limitations of the battery electric cutaway motor may limit the possible service to 8 to 9% of B-Line's paratransit annual service. By 2025, 16.4% of B-Line's paratransit annual service would be considered feasible and by 2030, an electric cutaway vehicle is projected to be able to complete about half of their annual service.

Since the paratransit fleet also expends significant amount of energy idling, CTE conducted an Endurance Analysis, which brought the energy requirements of the HVAC while idling into consideration for determining the range of these vehicles. Endurance may be more representative of the paratransit duty cycle as it accounts for idling energy during breaks, loading, or pauses in service along with miles traveled. Taking into account endurance, by 2025, only 4.4% of B-Line's paratransit annual service would be considered feasible. The results found that idling would have a significant detrimental impact on cutaway range.

Based on these results, BCAG opted to refrain from applying a full zero-emission transition plan to their paratransit cutaway fleet in this current scope. BCAG, however, requested CTE to introduce fuel cell electric cutaways in future procurement cycles with the goal of transitioning up to 20% of their paratransit fleet composition from gasoline to fuel cell starting in 2030. BCAG may need to submit a request for exemption from the zero-emission bus purchase requirements in section 2023.1(c).

## Description of ZEB Technology Solutions Considered

For this study, CTE developed 4 scenarios to compare to a baseline scenario and analyze the feasibility and cost effectiveness of implementing each bus technology as well as the co-implementation of both technologies. The scenarios are referred to by the following titles and described, in detail, below. A baseline scenario was developed to represent the typical "business-as-usual" case with retention of ICE buses for cost comparison purposes.

0. Baseline (current technology)
1. BEB Only

2a. Mixed Fleet - BEB Majority

2b. Mixed Fleet - FCEB Majority

3. FCEB Only

In the **BEB with Depot-Only Charging scenario**, BEBs are purchased and deployed only on blocks that are within a BEB's achievable range as determined by CTE's modeling. If depot-charged BEBs are not capable of meeting a transit agency's daily service requirements, there is an exception in the ICT regulation that will allow the agency to request an exemption to retain ICE buses in their fleet. Based on CTE's modeling, all of B-Line's blocks are fully achievable using BEB technology by 2035.

In the **Mixed Fleet – BEB Majority – (75% BEB) scenario**, FCEBs supplement a primarily BEB fleet to make up a fully ZEB fleet. The costs for infrastructure and installation of two different charging and fueling infrastructures are taken into account. FCEBs and hydrogen fuel, however, are more expensive than BEBs and electricity, so this scenario allows B-Line to assign the less expensive BEB technology where possible and supplement service with FCEBs as needed in support of resilience and redundancy adaption measures.

A **Mixed Fleet – FCEB Majority (75% FCEB) scenario** BEBs supplement a primarily FCEB fleet to make up a fully ZEB fleet. The costs for infrastructure and installation of two different charging and fueling infrastructures are taken into account. Based on CTE's modeling, all of B-Line's blocks are fully achievable using BEB technology by 2035, however, the range of FCEBs already currently exceed that of BEBs. This assessment therefore considers FCEBs capable of replacing diesel buses at a 1:1 ratio and allows B-Line the flexibility to operate the FCEBs in any of its blocks. In turn, blocking assignments are a key consideration for BEBs, particularly for those that are purchased prior to 2035. Overall, a mixed fleet is more resilient as it would allow service to continue if either fuel became temporarily unavailable for any reason.

Finally, the **FCEB Only scenario** was developed to examine the costs for hydrogen fueling and transitioning to a 100% FCEB fleet. A fully FCEB fleet avoids the need to install two types of fueling infrastructure by eliminating the need for depot charging equipment. Fleets comprised entirely of fuel cell electric buses also offer the benefit of scalability compared to battery electric technologies. Adding FCEBs to a fleet does not necessitate large complementary infrastructure upgrades. Despite this benefit, the cost of FCEBs and hydrogen fuel are still more expensive than BEBs and electricity at current market prices.

When considering the various scenarios, this study can be used to develop an understanding of the range of costs that may be expected for BCAG's ZEB transition, but ultimately, can only provide an estimate. Furthermore, this study aims to provide an overview of the myriad considerations the agency must take into account in selecting a transition scenario that go beyond cost, such as space requirements, safety implications, and operational changes that may differ between scenarios.

# D

# Current Bus Fleet Composition and Future Bus Purchases

## Fleet Assessment Methodology

The Fleet Assessment projects a timeline for the replacement of existing buses with BEBs and FCEBs. The timeline is consistent with BCAG's fleet replacement plan that is based on the 12-year service life of transit buses and 7-year service life of cutaways. This assessment also includes a projection of fleet capital costs over the transition timeline.

## ZEB Cost Assumptions

CTE and BCAG developed cost assumptions for future bus purchases. Key assumptions for bus costs for the BCAG Transition Plan are as follows:

- ICE vehicle prices were provided by BCAG and are inclusive of costs for configurable options and taxes.
- Battery Electric 35'/40' and Fuel Cell Electric 35'/40' prices are from the 2019 CA State Contract Bus Pricing Report plus the annual PPI and tax (7.25%).
- Battery Electric 35'/40' prices include $50K for extended battery warranty & $120K for configurable options.
- Fuel Cell Electric 35'/40' prices include $11k for extended fuel cell battery warranty & for $120K configurable options.
- Electric Cutaway price is based on the CA State Contract and also includes $50K for extended battery warranty & $75K for configurable options and tax (7.25%).
- Fuel Cell Cutaway price is estimated from the battery-electric cutaway price + $100,000 for fuel cell components (based on comparable costs for fuel cell trucks) and also includes $11k for extended fuel cell battery warranty & $75K for configurable options and tax (7.25%). No such vehicle exists on the market today.
- BEB range will improve, but the cost will remain stable due to economies of scale.
- The battery capacity will continue to increase, but the cost will not increase or decrease.
- Annual costs were not adjusted for inflation.
- Costs for retrofits or bus conversions are not included because BCAG does not plan to convert any ICE buses to battery electric powertrains.

*Table 1- Fleet Assessment Cost Assumption*

| | Fuel Type | | | | |
|---|---|---|---|---|---|
| **Length** | CNG | Gas | Diesel | Electric | Fuel Cell |
| **Cutaway** | NA | $70,000 | NA | NA | $446,000* |

| | | | | | |
|---|---|---|---|---|---|
| **35'** | NA | NA | $575,000 | $967,000 | $1,262,000* |
| **40'** | $399,000 | NA | $600,000 | $978,000 | $1,262,000 |

*Bus size not currently available for this technology

# Description of BCAG's Current Fleet

B-Line's current service and fleet composition provide the baseline for evaluating the costs of transitioning to a zero-emission fleet. BCAG staff provided the following key data on current service:

- Fleet composition by powertrain and fuel
- Routes and blocks
- Mileage and fuel consumption
- Maintenance costs

## Fleet

In 2021, the B-Line bus fleet included 29 diesel buses used for fixed route service, and 22 gasoline powered cutaways used for paratransit service. Bus services operate out of one depot in Chico, CA. Operations, maintenance, and fueling functions are performed at the depot.

## Routes and Blocks

B-Line's current service consists of 21 fixed routes run on 57 blocks. Routes range in length from 4.26 miles to 52.26 miles and blocks range in distance from 45.63 miles to 225.34 miles. Buses pull out as early as 4:25 and return as late as 22:20. BCAG's service runs through the County of Butte, the City of Chico, the City of Oroville, and the Town of Paradise.

## Current Mileage and Fuel Consumption

**Annual mileage of the fleet:**
1,940,000 miles

B-Line's ZEB Transition Plan assumes that the amount of service miles will remain the same.

**Annual fuel consumption:**
59,000 therms of CNG

230,000 gallons of diesel

90,000 gallons of gasoline

**Fleet average efficiency:**
5.75 miles per DGE

**BCAG current fuel expense:**
$1,217,000 per year

**Average fuel costs:**
$3.80 per diesel gallon

$1.79 per therm of CNG

$3.60 per gasoline gallon

## ICE Maintenance Costs

In 2019, BCAG spent approximately $729k on scheduled and unscheduled maintenance, including both parts and labor, for the entire fleet. This results in the average annual maintenance costs per mile by vehicle type in **Table 2.** Buses also undergo one engine overhaul at midlife summarized in **Table 3**.

*Table 2 - Labor and Materials Cost Assumptions*

| Vehicle Type | Estimate (Per Mile) |
|---|---|
| **30'/35' Diesel Bus** | $ 0.32 |
| **40' Diesel Bus** | $ 0.35 |
| **Gas Cutaway** | $ 0.33 |

*Table 3 - Midlife Overhaul Cost Assumptions*

| Type | Overhaul Scope | Estimate |
|---|---|---|
| **Diesel** | Engine/Transmission Overhaul | $56k per bus |
| **Cutaway** | Engine/Transmission Overhaul | $10k per cutaway |

# Zero-Emission Bus Procurement Plan and Schedule

As previously discussed, a fleet made up primarily of depot-charged BEBs (75% of the fleet) with 25% FCEBs will be sufficient to meet B-Line's service demands. BCAG's fleet transition strategy is to replace each diesel and compressed natural gas (CNG) bus with a BEB or FCEB as they reach the end of their 12-year useful life beginning in 2030. **Figure 5** below provides the number of each bus type that will be purchased each year through 2040 with this replacement strategy.

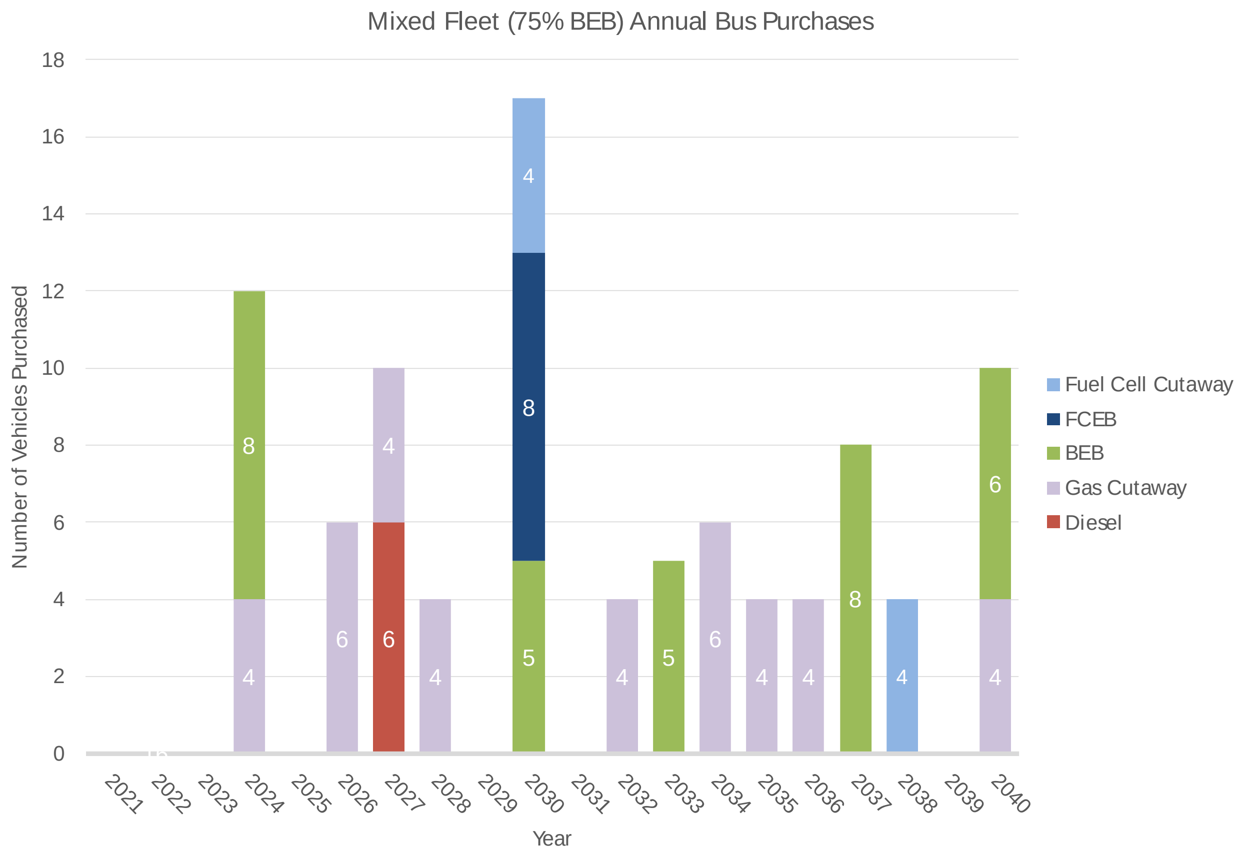


*Figure 5 - Projected Bus Purchases, Mixed Fleet - BEB Majority*

**Figure 6** demonstrates the annual composition of B-Line's fleet through 2040. As previously discussed, B-Line does not plan to fully transition their paratransit cutaway fleet until a suitable zero-emission vehicle is available, but they do want to begin integrating zero-emission cutaways into their fleet by transitioning four cutaways to fuel cell vehicles in 2030. By 2040, B-Line's bus fleet will consist entirely of BEB and FCEBs. The fleet will remain the same size throughout the transition period.

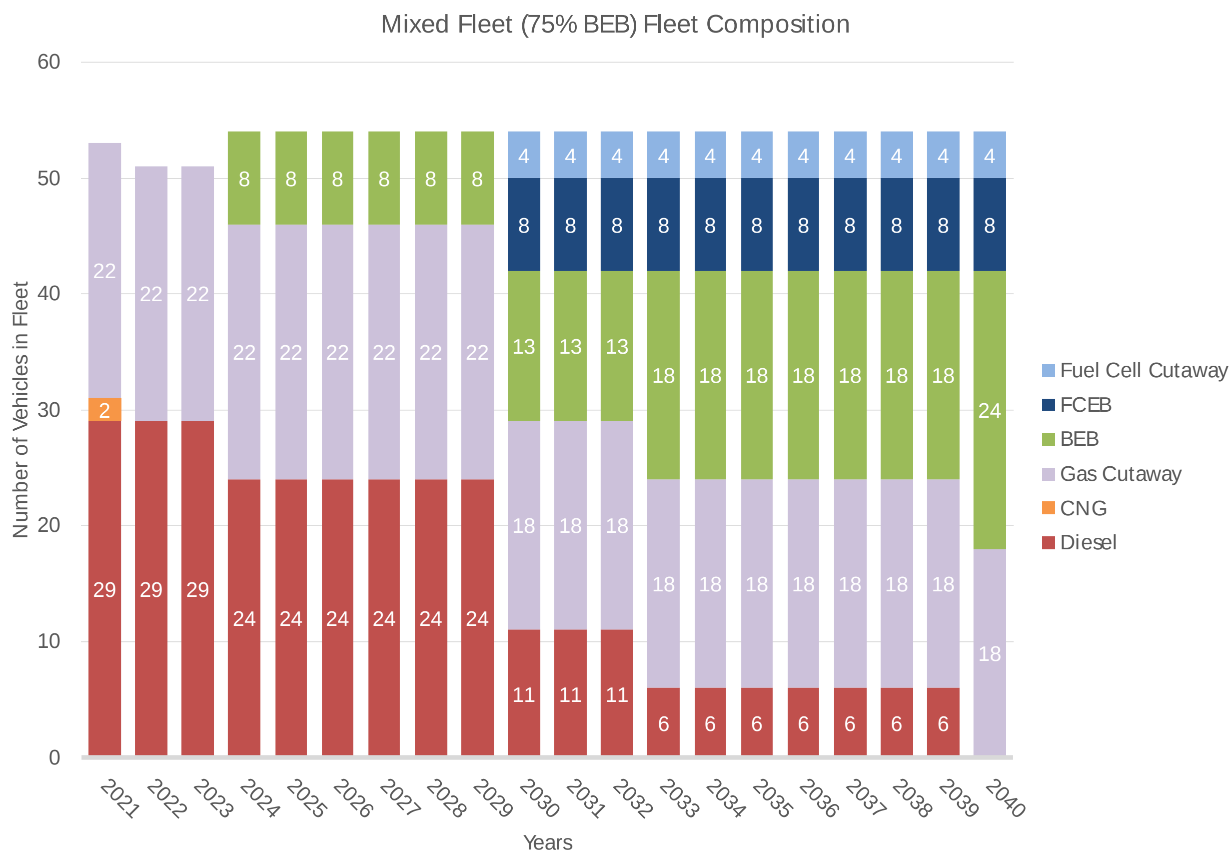


*Figure 6 - Annual Fleet Composition, Mixed Fleet - BEB Majority*

**Figure 7** shows the annual total bus capital costs in the selected transition scenario. 2030 is a major purchase year when 13 diesel buses will reach the end of their 12-year useful service life and 16 gasoline powered cutaways will reach the end of their 7-year useful life.

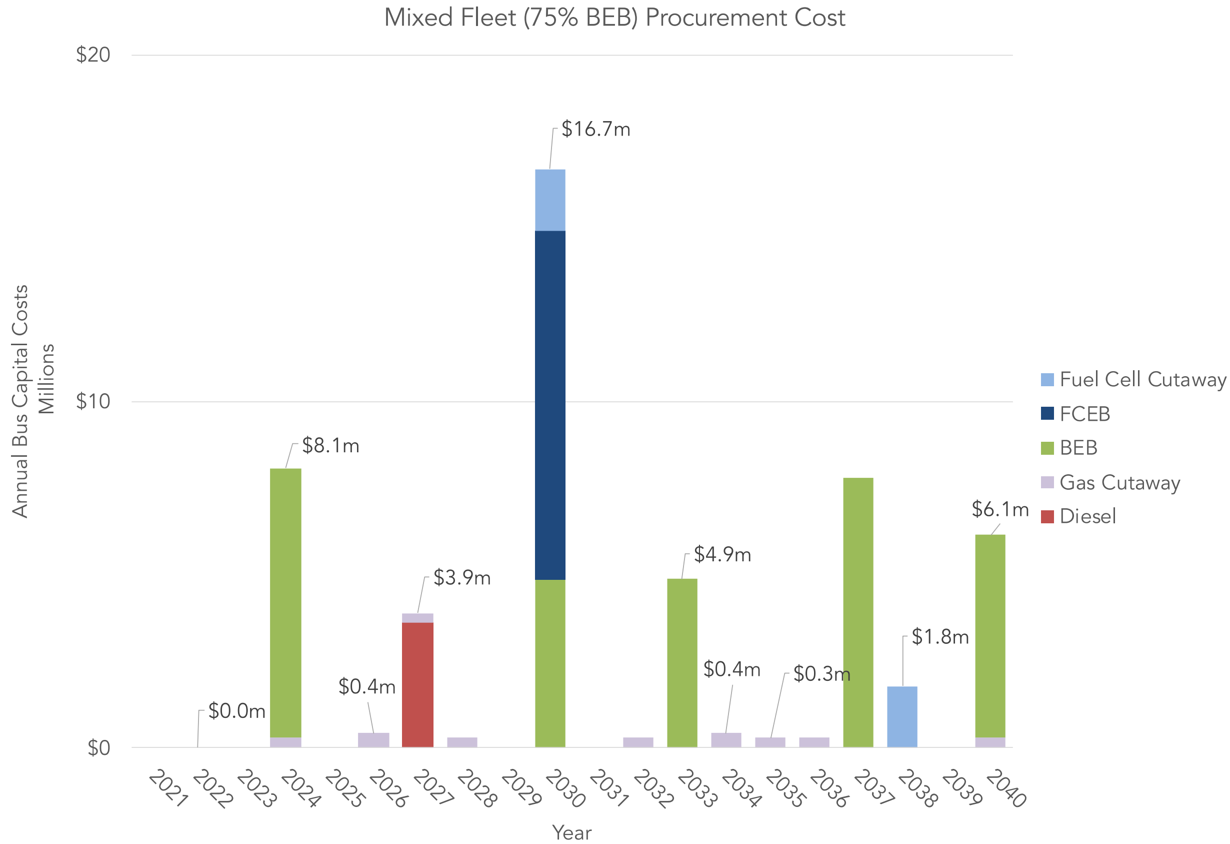


*Figure 7 - Annual Capital Cost, Mixed Fleet - BEB Majority*

As seen in **Table 4**, the capital investment required for purchasing ZEBs is significantly higher than for ICE buses. This highlights the importance of staying vigilant in the search for funding opportunities to help fill this gap.

*Table 4 - BCAG Bus Capital Investment to transition to a 100% ZEB fleet by 2040*

| | ICE Baseline* | ZEB Incremental Costs | Total Investment |
|---|---|---|---|
| **Bus Capital Costs** | $35M | $16M | $51M |

*Represents the capital costs that would have been incurred in the absence of the ICT Regulation

## Additional Considerations

When purchasing FCEBs and BEBs, the process may differ slightly from the process BCAG currently uses to purchase vehicles. First, when contracting with FCEB and BEB manufacturers, BCAG should ensure expectations are clear between the bus OEM and the agency. As with a CNG and diesel purchases the agreement should be clear regarding the bus configurations, technical capabilities, build and acceptance process, production timing with infrastructure, warranties, training, and other contract requirements. Additionally, by developing and negotiating specification language collaboratively with the bus vendor(s), BCAG can work with the vendor(s) to customize the bus to their needs as much as is appropriate, help advance the industry based on agency requirements and recommended advancements, ensure the acceptance and payment process is fully clarified ahead of time, fully document the planned capabilities of the bus to ensure accountability, and generally preempt any unmet expectations. Special attention should be given in defining the technical capabilities of the vehicle, since defining these for ZEBs may differ from ICE buses.

When developing RFPs and contracting for BEB and FCEB procurement, BCAG should specify the source of funding for the vehicle purchases to ensure grant compliance, outline data access requirements, define the price and payment terms, establish a delivery timeline, and outline acceptance and performance requirements. BCAG should test the buses upon delivery for expected performance in range, acceleration, gradeability, highway performance, and maneuverability. Any such performance requirements must be included in the technical specification portion of the RFP and contract to be binding for the OEM. Defining technical specifications for ZEBs will also differ slightly from their current diesel, CNG and gasoline vehicles since they will need to include requirements for hydrogen fuel cell and battery performance. It is also recommended that BCAG purchase an extended battery warranty for the vehicles, which should be specified in the RFP and contract.

FCEB procurement will also differ from ICE procurements since there are fewer OEMs presently manufacturing these vehicles, although this is expected to change with increasing demand. BCAG will also be able to apply for additional funding for these vehicles through zero-emission vehicle specific funding opportunities, which are discussed further in which are discussed further in **Section H: Potential Funding Sources.**

# E

# Facilities and Infrastructure Modifications

## BCAG Facility Configuration and Depot Layout

**Depot Address:**
326 Huss Lane, Chico CA, 95928

**Electric Utility:**
PG&E

**Located in a NOx Exempt Area?**
No

**Bus Parking Capacity:**
50+

**Current Vehicle Types Supported:**
BCAG's depot currently supports fueling and maintenance of diesel and CNG buses and gasoline cutaways.

**Propulsion Types That Will be Supported at Completion of ZEB Transition:**
Battery electric and hydrogen fuel cell electric propulsion

## Facilities Assessment Methodology

Mixed fleet BEB and FCEB deployments such as BCAG's require installation of charging stations and improvements to existing electrical infrastructure as well as hydrogen fueling infrastructure. FCEB deployments require installation of a fueling station and may require improvements such as upgrades to the switchgear or utility service connections. Planning and design work, including development of detailed electrical and construction drawings required for permitting, is also necessary once specific charging equipment has been selected.

Building off of the fleet procurement schedule that was outlaid in the Fleet Assessment, CTE then uses industry average pricing to develop infrastructure scenarios that estimate the cost of building out the infrastructure necessary to support a full fleet transition to ZEBs. This plan assumes that infrastructure projects will be completed prior to each bus delivery. To project the costs of fueling infrastructure, CTE used industry pricing provided by A&E subcontractors and an infrastructure build timeline based on the procurement timeline. This plan assumes that infrastructure projects will be completed prior to each bus delivery. These projects are described in detail below.

## Infrastructure Upgrade Requirements to Support Zero-Emission Buses

### Description of Depot-Charging Infrastructure Considered

In the Mixed Fleet: BEB Majority scenario, charging infrastructure is required to service a total of 24 BEBs and additional hydrogen fueling infrastructure for eight FCEBs and four fuel cell electric cutaways to support a completely zero-emission bus fleet by 2040. Because there are separate costs associated with each type of ZEB technology, the facilities assessment for this scenario is broken down by each fuel type. The total cost of this scenario will be slightly more than $11.2M.

## BEB Charging Infrastructure Summary

In order to support the BEB portion of the fleet, BCAG will need to work with a contractor to conduct detailed infrastructure planning, purchase chargers and dispensers, and add service capacity to their site. The estimated infrastructure costs for these technology & infrastructure expenses are as follows:

- **Infrastructure planning.** Building charging infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot is estimated at $200,000.
- **Dispensers and Chargers.** A total of 24 dispensers will be needed at BCAG's depot to accommodate 24 BEBs in the fleet. In total, this scenario will require 12 chargers under the assumption that there will be two dispensers per chargers. Charging projects include purchase and installation of 150 kW chargers and dispensers. This would come to $4.6 million for BCAG by 2040.
- **Electric Service Upgrade.** BCAG requires an estimated 2 MW of additional electricity capacity by 2040 to accommodate charging for 24 BEBs. To meet the growing demand for electricity, the BROC depot will need to upgrade its system to at least 1 MW of capacity by 2022 and up to 2 MW of capacity by 2033. This is estimated to cost around $1.9 million over the transition period.
- **General Conditions / General Requirements:** A 15% General Conditions and Requirements cost is applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **Contingency.** A 20% contingency is added on all project costs.
- **Market Factor.** 7% is added on all project costs, conditions, and contingency.
- **Bonds and Insurance.** 2% is added on all project costs, conditions, contingency, and market factors.
- **Contractor's Fee.** 6.5% is added on all project costs, conditions, contingency, and market factors.

CTE recommends that BCAG complete the infrastructure over time as necessary to support their gradual BEB deployments. The estimated total BEB infrastructure costs for the Mixed Fleet scenario are approximately $6.7 million (see **Figure 8**) and costs are incrementally incurred with each BEB purchase.

## FCEB Fueling Infrastructure Summary

In addition to BEB charging, hydrogen fueling is required to support the Mixed Fleet: BEB Majority Scenario. Like BEB infrastructure, a FCEB infrastructure deployment will also require hiring an infrastructure planning contractor. A storage capacity project, maintenance bay upgrades and fueling infrastructure costs will also be necessary to allow BCAG to fuel their hydrogen fuel cell vehicles on site. Infrastructure is assumed to be built out in one project that will conclude prior to the first FCEB deployment in 2030. The estimated infrastructure costs for these technology & infrastructure expenses are as follows:

- **Infrastructure planning.** Building hydrogen infrastructure requires planning at the depot. This assessment assumes that a planning project costs $200,000 and occurs only once per depot. The total cost of planning projects for BCAG's single depot will be approximately $200,000.
- **Storage Capacity Projects.** The total cost for storage capacity projects at BCAG will be approximately $500,000 over the transition period.
- **Maintenance bay upgrades.** Maintenance bay upgrades are required to make the bays compliant with hydrogen safety regulations. At BCAG, CTE integrated the A&E's estimated cost for each bay upgrade at $58,000. This cost estimate stems from the requirement of additional ventilation systems necessary for hydrogen detection. With six maintenance bay and gas detection upgrades, the total cost for hydrogen infrastructure in this scenario is estimated at $1.2 million.
- **H2 Fueling infrastructure.** The number of dispensers is a variable that can be scaled to fit the number of vehicles that need to be fueled. A single dispenser is capable of fueling a single bus every 15 minutes. Therefore, having two dispensers will allow vehicles to be fueled twice as fast as a single dispenser. Because this scenario requires fueling only 12 vehicles, which could be fueled in three hours with a single dispenser, and since this three-hour fueling window is acceptable to BCAG, a single dispenser and associated fueling elements is assumed, which is estimated to cost $1.9 million.

- **General Conditions / General Requirements:** A 15% General Conditions and Requirements cost is applied to all projects to account for costs incurred by the contractor that are not directly construction costs, such as business operations.
- **Contingency.** A 20% contingency is added on all project costs.
- **Market Factor.** 7% is added on all project costs, conditions, and contingency.
- **Bonds and Insurance.** 2% is added on all project costs, conditions, contingency, and market factors.
- **Contractor's Fee.** 6.5% is added on all project costs, conditions, contingency, and market factors.

**Figure 8** shows the estimated infrastructure costs for the FCEB technology, which includes the following costs and reaches a sum of $4.6 million.

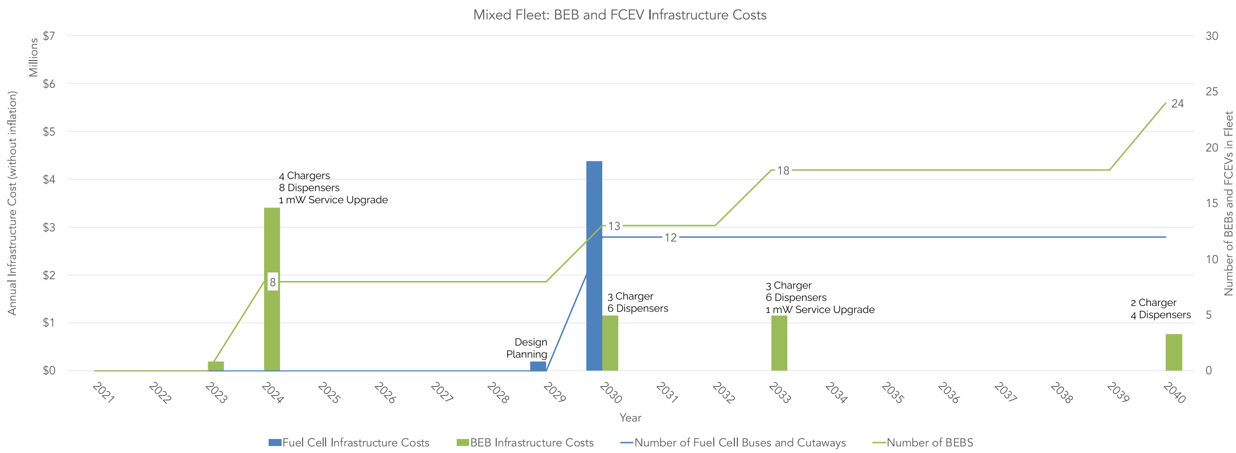


*Figure 8 - Infrastructure Costs, Mixed Fleet - BEB Majority Charging Scenario*

In addition to assessing the fueling and maintenance infrastructure requirements for BCAG's ZEB transition, CTE also conducted a Redundancy, Resilience, and Emergency Response (3R) Assessment, which investigates the new risks to an agency's ability to provide service during power outages or fuel disruptions and the ability to support required emergency response activities, such as community evacuation with a full ZEB fleet. The project team applied a risk assessment methodology to evaluate various adaptation measures that reduce risks from identified threats. The effectiveness of adaptation measures is informed by factors such as cost, risk reduction capabilities, a transit agency's risk tolerances, facility constraints, and environmental impacts.

BCAG's primary concerns are addressing ZEB fleet operation in the event of a fuel interruption (i.e., power outage or hydrogen fuel delivery disruption) and planning for evacuation support. BCAG has previously been impacted by severe wildfires, which required community evacuation, and may also put BCAG at risk from planned power outages. It is expected that severe wildfires and flooding events will become more likely and more extreme in the future due to climate change impacts.

CTE worked with BCAG to determine what the agency's minimum service requirements would be under several scenarios that would affect the agency's ability to fuel ZEBs, such as a wildfire, flood, or power outage and then created adaptation measures to meet the determined service demands. Adaptation measures explored include backup power options, such as a generator or maintaining additional hydrogen storage on-site, maintaining backup buses or creating an alternative fueling site. Adaptation measures were assessed to cost between $400,000 to $3,189,000 with varying effectiveness. Although BCAG has not chosen an adaptation package at this time, the knowledge that these options are available gives the agency confidence in their ability to provide necessary evaluation services with a fully ZEB fleet although implementing such a strategy will add to the capital costs of their transition.

# F

# Providing Service in Disadvantaged Communities

## Providing Zero-Emission Service to DACs

In California, CARB defines disadvantaged communities (DACs) as communities that are both socioeconomically disadvantaged and environmentally disadvantaged due to local air quality. Lower income neighborhoods are often exposed to greater vehicle pollution levels due to proximity to freeways and the ports, which puts these communities at greater risk of health issues associated with tailpipe emissions.[9] ZEBs will reduce energy consumption, harmful emissions, and direct carbon emissions in six opportunity zones and disadvantaged communities in rural Northern California as shown in in the service map below. B-Line serves the following census communities identified as DACs: 6007003700 and 6007001300, which have a pollution burden of 85-90% according to CalEnviroScreen. They are shown in **Figure 9** below.

Environmental impacts, both from climate change and from local pollutants, disproportionately affect transit riders. For instance, poor air quality from tailpipe emissions and extreme heat harm riders waiting for buses at roadside stops. The transition to zero-emission technology will benefit the region by reducing fine particulate pollution and improving overall air quality. In turn, the fleet transition will support better public health outcomes for residents in DACs served by the selected routes.

Public transit has the potential to improve social equity by providing mobility options to low-income residents lacking access to a personal vehicle and helping to meet their daily needs. In California, transit use is closely correlated with car-less households as they are five times more likely to use public transit than households with at least one vehicle.[10] Although 21% of Californians in a zero-vehicle household are vehicle free by choice, 79% do not have a vehicle due to financial limitations. Many low-income people therefore rely solely on public transportation for their mobility needs.[11] B-Line's current fleet of fixed route diesel buses consume an annual average of 247,000 gallons of diesel. The combustion of this fuel exposes those who are reliant on public transportation to diesel exhaust, which has been classified as a probable human carcinogen with links to asthma and other lung related health issues.[12] Portions of B-Line's service area are in the 90th-100th percentile for diesel particulate matter (PM) according to CalEnviroScreen 4.0. Moving B-Line's fleet to zero-emission technology will help alleviate this pollution, which will improve the health of communities impacted by high diesel PM and all Sacramento Valley communities.

Access to quality transit services provides residents with a means of transportation to go to work, to attend school, to access health care services, and run errands. By purchasing new vehicles and decreasing the overall age of its fleet, B-Line is also able to improve service reliability and therefore maintain the capacity to serve low-income and disadvantaged populations. Replacing diesel vehicles with zero-emission vehicles, will also benefit these populations by improving local air quality and reducing exposure to harmful emissions from diesel exhaust.

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[9] Reichmuth, David. 2019. Inequitable Exposure to Air Pollution from Vehicles in California. Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019

[10] Grengs, Joe; Levine, Jonathan; and Shen, Qingyun. (2013). Evaluating transportation equity: An inter-metropolitan comparison of regional accessibility and urban form. FTA Report No. 0066. For the Federal Transit Administration

[11] Paul, J & Taylor, BD. 2021. Who Lives in Transit Friendly Neighborhoods? An Analysis of California Neighborhoods Over Time. Transportation Research Interdisciplinary Perspectives. 10 (2001) 100341. https://reader.elsevier.com/reader/sd/pii/S2590198221000488?token=CABB49E7FF438A88A19D1137A2B1851806514EF576E9A2D9462D3FAF1F6283574907562519709F8AD53DEC3CF95ACF27&originRegion=us-east-1&originCreation=20220216190930

[12] National Resources Defense Council Coalition for Clean Air. No breathing in the aisles — diesel exhaust inside school buses. New York: The Council; January 2001. Available: www.nrdc.org/air/transportation/schoolbus/sbusinx.asp

## Map of Disadvantaged Communities served by B-Line

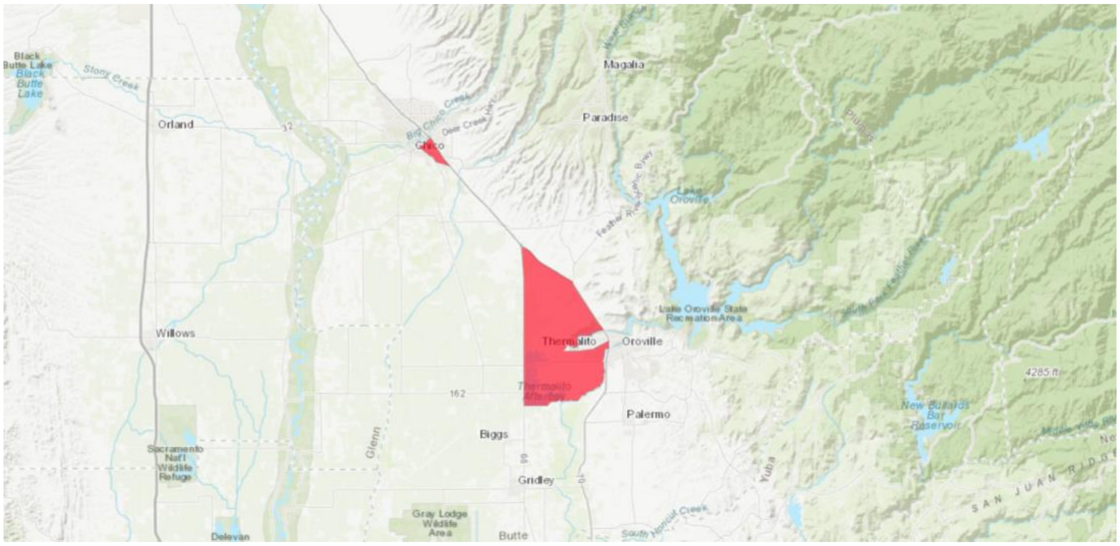


*Figure 9 - B-Line Disadvantaged Communities Service Map*

## Emissions Reductions for DACs

Greenhouse gases (GHG) are the compounds primarily responsible for atmospheric warming and include carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$). The effects of greenhouse gases are not localized to the immediate area where the emissions are produced. Regardless of their point of origin, greenhouse gases contribute to overall global warming and climate change.

Criteria pollutants include carbon monoxide (CO), nitrogen oxides (NOx), particulate matter under 10 and 2.5 microns ($PM_{10}$ and $PM_{2.5}$), volatile organic compounds (VOC), and sulfur oxides ($SO_X$). These pollutants are considered harmful to human health because they are linked to cardiovascular issues, respiratory complications, or other adverse health effects.[13] These compounds are also commonly responsible for acid rain and smog. Criteria pollutants cause economic, environmental, and health effects locally where they are emitted. CARB defines DACs in part as disadvantaged by poor air quality because polluting industries or freight routes have often been cited in these communities. The resulting decrease in air quality has led to poorer health and quality of life outcomes for residents.

By transitioning to ZEBs from diesel buses, B-Line's zero-emission fleet will produce fewer carbon emissions and fewer harmful pollutants from the vehicle tailpipes. Communities disadvantaged by pollution served by B-Line's fleet will therefore directly benefit from the reduced tailpipe emissions of ZEBs compared to ICE buses.

## Estimated Ridership in DACs

B-Line serves a diverse community, with a large portion of their daily passengers being individuals without cars (by choice or because of financial limitation), university students, and paratransit riders.  Although ridership on transit in general has been decreasing over the past few years due, at least in part, to lower gas prices, combined with more affordable low-cost automobiles, which has allowed more people the opportunity to own and operate personal cars, the ridership reductions seen by B-Line in recent years are more directly tied to reduced population in their service

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13 Institute of Medicine. Toward Environmental Justice: Research, Education, and Health Policy Needs. Washington, DC: National Academy Press, 1999; O'Neill MS, et al. Health, wealth, and air pollution: Advancing theory and methods. Environ Health Perspect. 2003; 111: 1861-1870; Finkelstein et al. Relation between income, air pollution and mortality: A cohort study. CMAJ. 2003; 169: 397-402; Zeka A, Zanobetti A, Schwartz J. Short term effects of particulate matter on cause specific mortality: effects of lags and modification by city characteristics. Occup Environ Med. 2006; 62: 718-725.

area following the Camp Fire. [14] In 2018, the Camp Fire burned through Butte County and destroyed homes and businesses in the town of Paradise, which is served by BCAG's transit services. In 2020, B-Line's service was further reduced by the Coronavirus Disease 2019 SARS-CoV-2 (COVID/COVID-19) outbreak.

B-Line's service experienced significant reduction after the 2018 Camp Fire and has not returned to its original service levels and is not expected to. Since the beginning of the COVID-19 pandemic , the services have stayed the same with the exception of Route 40 and 41, which runs through areas affected by the Camp Fire—demand for bus service in Paradise has remained low. Based on BCAG's data of available ridership and total fares received from July 2018 through the month of June 2019 (pre-COVID levels), there were 949,871 fixed-route passengers and 141,277 paratransit passengers[15]. BCAG anticipates annual ridership to be less than this over the next five years. In response to the changing ridership needs, due in part to the Camp Fire and COVID, BCAG is conducting a Route Optimization Study, which will be completed in the Summer of 2022 in order to re-assess how to most efficiently serve individual routes as well as the whole system.

[14] Grengs, Joe, Jonathan Levine, and Qingyun Shen. (2013). Evaluating transportation equity: An inter-metropolitan comparison of regional accessibility and urban form. FTA Report No. 0066. For the Federal Transit Administration

[15] Page 21 of BCAG's Unmet Transit Needs Assessment – 2021/2022 [http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf](http://www.blinetransit.com/documents/UTN/2122-Transit-Needs-Assessment-Final.pdf)

# G

# Workforce Training

## BCAG's Current Training Program

BCAG is experienced in recruiting, hiring, training, and integrating new staff to ensure that BCAG's employees are qualified to provide quality services to their riders. The level of training that BCAG drivers and maintenance staff engage in is dependent upon their level of experience at time of hiring. BCAG's training is conducted by Transdev, which specializes in operator and maintenance training.

### Operator Development Program (ODP)

The Operator Development Program is designed to teach all the essential skills to enable Operators to do their job at the highest level of safety and competence. It integrates classroom courses, closed-course, and behind the wheel training modules. New hire training is 120 hours, and follow up training is required annually. Training includes:

- Technical Training
- Safe Driving
- Behind-the-Wheel (BTW) Training
- Cadetting In-service Training
- Ongoing Safety Monitoring
- Disability Awareness, Passenger Sensitivity, and Customer Service Training
- Training Documentation/Evaluation
- Operator Retraining

Operators must meet 33 Performance Standards and Skills.

### Mechanics Training

Transdev has developed a maintenance training program that ensures that technicians are equipped to diagnose and address every eventuality with precision, thereby ensuring the necessary order or repair is competed correctly the first time and that a safe fleet of vehicles is available for operations. Technicians also receive annual refresher trainings, and any new systems and equipment that are added to BCAG's operations are immediately incorporated into the program.

### Dispatchers and Supervisors Training

All Dispatchers and Road Supervisors complete all modules of Operator training, with 40 hours of additional training and on the job training. This includes job shadowing and ongoing training completed at least quarterly.

## BCAG's ZEB Training Plan

### OEM Training

BCAG plans to take advantage of trainings from the bus manufacturers and station suppliers, including maintenance and operations training, station operations and fueling safety, first responder training and other trainings that may be offered by the technology providers. OEM trainings provide critical information on operations and maintenance aspects specific to the equipment model procured. Additionally, many procurement contracts include train-the-trainer courses through which small numbers of agency staff are trained and subsequently train agency colleagues. This method provides a cost-efficient opportunity to provide widespread agency training on new equipment and technologies.

### Bus and Fueling Operations and Maintenance

The transition to a zero-emission fleet will have significant effects on BCAG's workforce. Meaningful investment is required to upskill maintenance staff and bus operators trained in ICE vehicle maintenance and ICE fueling infrastructure.

BCAG training staff will work closely with the OEM providing vehicles to ensure all mechanics, service employees, and bus operators complete necessary training prior to deploying ZEB technology and that these staff undergo refresher training annually and as needed. BCAG staff will also be able to bring up any issues or questions they may have about their training with their trainers. Additionally, trainers will observe classes periodically to determine if any staff would benefit from further training.

## ZEB Training Programs Offered by Other Agencies

Several early ZEB adopters have created learning centers for other agencies embarking on their ZEB transition journeys. One such agency is SunLine Transit Agency, which provides service to the Coachella Valley and hosts the West Coast Center of Excellence in Zero Emission Technology (CoEZET). The Center of Excellence supports transit agency adoption, zero-emission commercialization and investment in workforce training. Similarly, AC Transit offers training courses covering hybrid and zero-emission technologies through their ZEB University program. BCAG plans to take advantage of these trainings offered by experienced agencies.

# H

# Potential Funding Sources

## Sources of Funding for ZEB Transition

BCAG is prepared to pursue funding opportunities at the federal, state, and local level, as necessary and as available.

### Federal

BCAG is exploring federal grants through the following funding programs: Federal Transit Administration's (FTA) Urbanized Area Formula program; discretionary grant programs such as the Bus and Bus Facilities (B&BF) program, Low or No Emission Vehicle Deployment Program (Low-No), and Better Utilizing Investments to Leverage Development (BUILD) grant; and other available federal discretionary grant programs.

Annual Reliable Funding

- Federal Transportation Administration (FTA)
    - Urbanized Area Formula program
    - State of Good Repair Grants

Future Funding Opportunities

- United States Department of Transportation (USDOT)
    - Better Utilizing Investments to Leverage Development (BUILD) Grants
- Federal Transportation Administration (FTA)
    - Bus and Bus Facilities Discretionary Grant
    - Urbanized Area Formula program
    - State of Good Repair Grants
    - Capital Investment Grants – New Starts
    - Capital Investment Grants – Small Starts
    - Low-or No-Emission Vehicle Grant
    - Metropolitan & Statewide Planning and Non-Metropolitan Transportation Planning
    - Flexible Funding Program – Surface Transportation Block Grant Program
- Federal Highway Administration (FHWA)
    - Congestion Mitigation and Air Quality Improvement Program
- Environmental Protection Agency (EPA)
    - Environmental Justice Collaborative Program-Solving Cooperative Agreement Program

### State

BCAG will also seek funding from state resources through grant opportunities including but not limited to Senate Bill 1 State of Good Repair (SGR), Transit and Intercity Rail Capital Program (TIRCP), Low Carbon Transit Operations Program (LCTOP) funding, the California Energy Commission's Clean Transportation Program as well as Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) for bus purchases when available.

Secured Funding

- California Department of Transportation (Caltrans)
    - State Transit Assistance (STA) + STA SB1

Future Funding Opportunities

- California Air Resources Board (CARB)
    - Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)
    - State Volkswagen Settlement Mitigation

    - Carl Moyer Memorial Air Quality Standards Attainment Program
    - Cap-and-Trade Funding
    - Low Carbon Fuel Standard (LCFS)
- California Transportation Commission (CTC)
    - Solution for Congested Corridor Programs (SCCP)
- California Department of Transportation (Caltrans)
    - Low Carbon Transit Operations Program (LCTOP)
    - Transportation Development Act
    - Transit and Intercity Rail Capital Program
    - Transportation Development Credits
    - New Employment Credit
- California Energy Commission

## Local

Additionally, BCAG will pursue local funding opportunities to support zero-emission bus deployment. While the aforementioned funding opportunities are mentioned by name, BCAG will not be limited to these sources and will regularly assess opportunities for fiscal support for the ZEB program.

# I

# Start-up and Scale-up Challenges

## Financial Challenges

Challenges can arise with any new propulsion technology, its corresponding infrastructure, or in training operators and maintenance staff. Nearly all transit agencies must contend with the cost barriers posed by zero-emission technologies. The current market cost of ZEBs is between $750,000 and $1,200,000, which is about $250,000 to $700,000 more costly than traditional diesel buses. Additionally, the necessary infrastructure to support these buses adds to the financial burden of transitioning to a ZEB fleet, as outlined below in **Table 5.** BCAG will seek financial support to cover the cost of their FCEBs from the resources discussed in Section H.

*Table 5 - Incremental Cost of ZEB Transition*

| Incremental cost of ZEB Transition | | | |
|---|---|---|---|
| | ICE Baseline* | ZEB Incremental Costs | ZEB Transition Scenario Costs |
| Bus Capital Expense | $35M | $16M | $51M |
| Fueling Infrastructure | $0 | $11M | $11M |
| Total | $35M | $27M | $62M |

*Represents the capital costs that would have been incurred in the absence of the ICT Regulation

As seen in **Table 5**, costs of required fueling infrastructure and fueling operations for ZEB technologies pose another hurdle for transit agencies transitioning to zero-emission service. Continued financial support at the local, state and federal level to offset the capital cost of this new infrastructure is imperative. For alternative fuels such as hydrogen, financial support from state and federal grant opportunities for green hydrogen supply chains and increasing economies of scale on the production side will ultimately benefit transit agencies deploying and planning for FCEBs and BEBs.

CARB can support BCAG by ensuring continued funding for the incremental cost of zero-emission buses and fueling infrastructure. Funding opportunities should emphasize proper transition and deployment planning and should not preclude hiring consultants to ensure best practices and successful deployments. The price and availability of hydrogen, both renewable and not, continue to be challenges that can be allayed by legislation subsidizing and encouraging renewable fuel production.

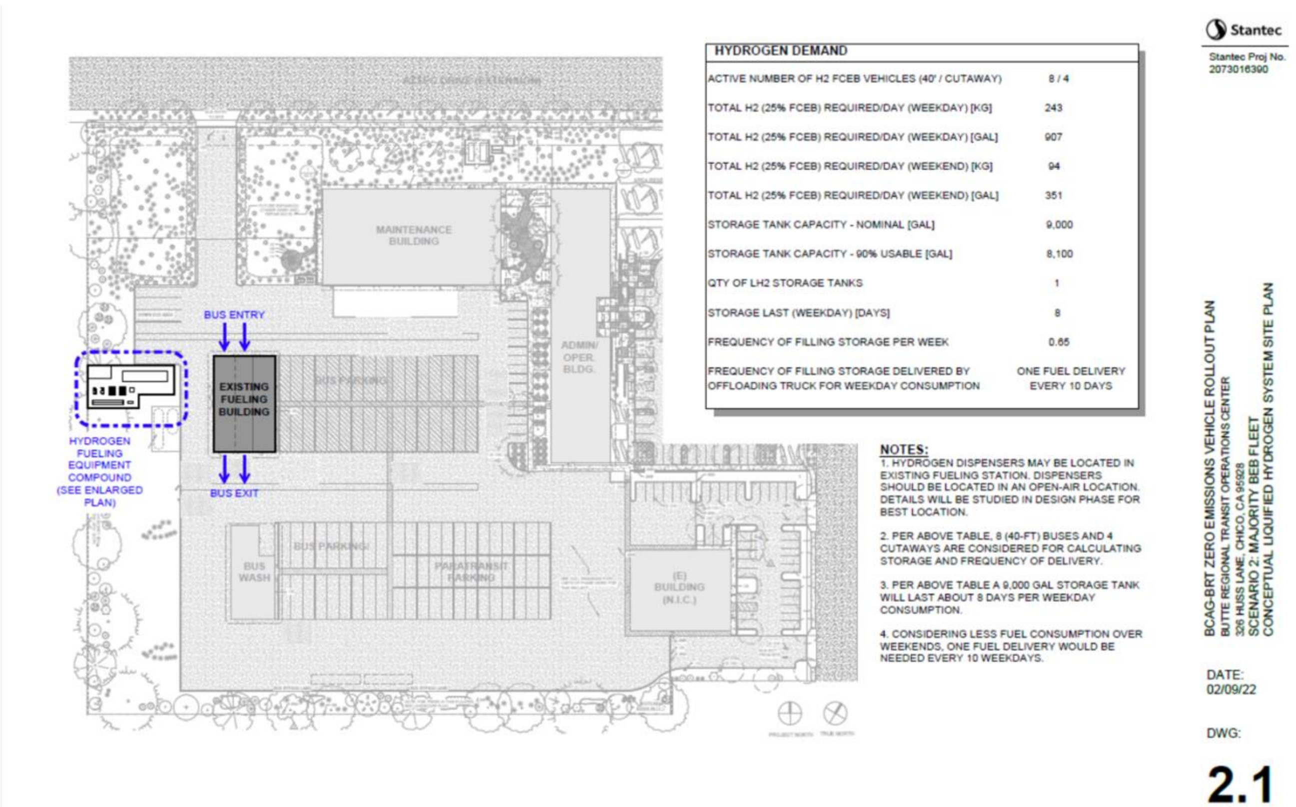
## Limitations of Current Technology

Beyond cost barriers, transit agencies must also ensure that available zero-emission technologies can meet basic service requirements of the agency's duty cycles. The applicability of specific zero-emission technologies will vary widely among service areas and agencies. As such, it is critical that transit agencies in need of technical and planning support have access to these resources to avoid failed deployment efforts. Support in the form of technical consultants and experienced zero-emission transit planners will be critical to turning Rollout Plans into successful deployments and tangible emissions reductions.

# Appendix A – Approved Board Resolution

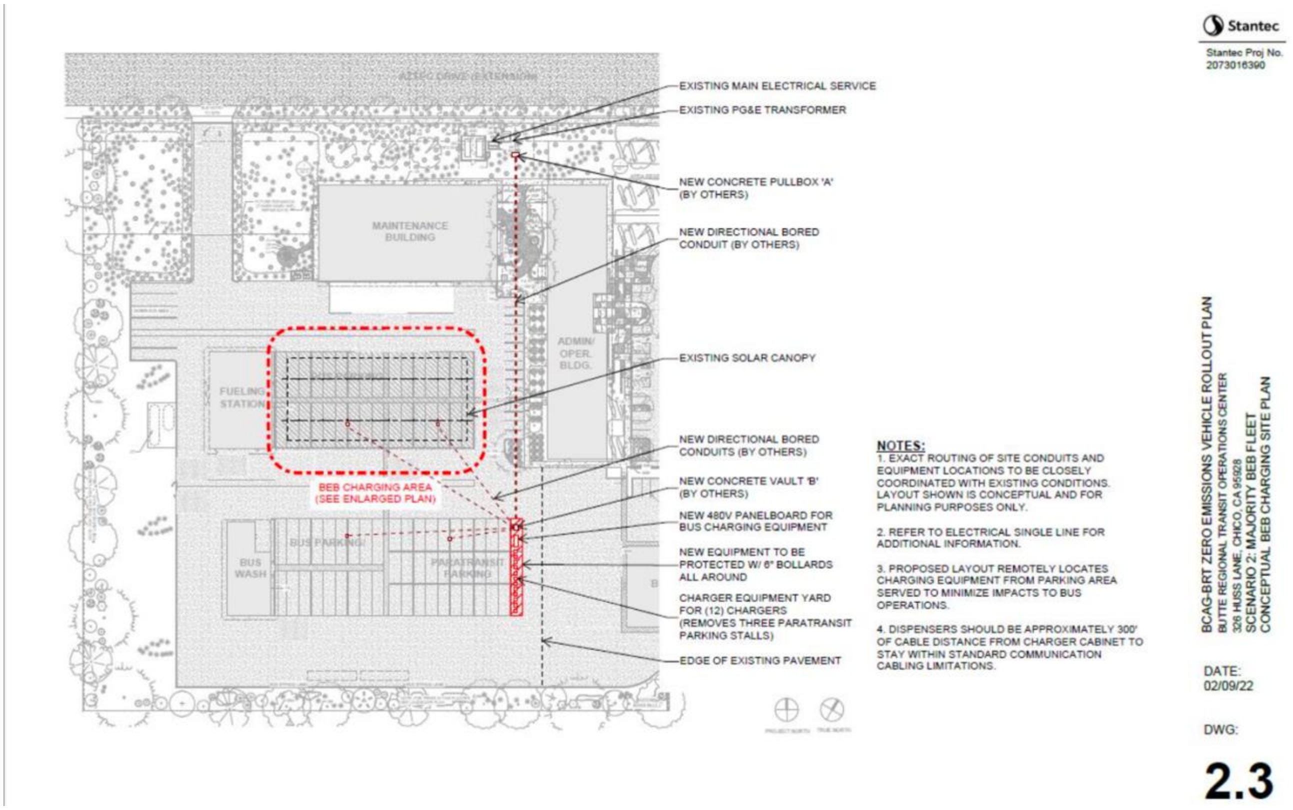
# Appendix B – ZEB Transition Site Plans

### Hydrogen infrastructure:




| HYDROGEN DEMAND | |
|---|---|
| ACTIVE NUMBER OF H2 FCEB VEHICLES (40' / CUTAWAY) | 8 / 4 |
| TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKDAY) [KG] | 243 |
| TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKDAY) [GAL] | 907 |
| TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKEND) [KG] | 94 |
| TOTAL H2 (25% FCEB) REQUIRED/DAY (WEEKEND) [GAL] | 351 |
| STORAGE TANK CAPACITY - NOMINAL [GAL] | 9,000 |
| STORAGE TANK CAPACITY - 90% USABLE [GAL] | 8,100 |
| QTY OF LH2 STORAGE TANKS | 1 |
| STORAGE LAST (WEEKDAY) [DAYS] | 8 |
| FREQUENCY OF FILLING STORAGE PER WEEK | 0.65 |
| FREQUENCY OF FILLING STORAGE DELIVERED BY OFFLOADING TRUCK FOR WEEKDAY CONSUMPTION | ONE FUEL DELIVERY EVERY 10 DAYS |

## Battery-electric infrastructure:



# Appendix C – Glossary

**Auxiliary Energy:** Energy consumed (usually as a by time measure, such as "x"kW/hour) to operate all support systems for non-drivetrain demands, such as HVAC and interior lighting.

**Battery Electric Bus:** Zero-emission bus that uses onboard battery packs to power all bus systems.

**Battery Nameplate Capacity:** The maximum rated output of a battery under specific conditions designated by the manufacturer. Battery nameplate capacity is commonly expressed in kWh and is usually indicated on a nameplate physically attached to the battery.

**Block:** Refers to a vehicle schedule, the daily assignment for an individual bus. One or more runs can work a block. A driver schedule is known as a "run."

**Charging Equipment:** The equipment that encompasses all the components needed to convert, control and transfer electricity from the grid to the vehicle for the purpose of charging batteries. May include chargers, controllers, couplers, transformers, ventilation, etc.

**Depot Charging:** Centralized BEB charging at a transit agency's garage, maintenance facility, or transit center. With depot charging, BEBs are not limited to specific routes, but must be taken out of service to charge.

**Energy:** Quantity of work, measured in kWh for ZEBs.

**Energy Efficiency:** Metric to evaluate the performance of ZEBs. Defined in kWh/mi for BEBs, mi/kg of hydrogen for FCEBs, or miles per diesel gallon equivalent for any bus type.

**Fuel Cell Electric Bus:** Zero-emission bus that utilizes onboard hydrogen storage, a fuel cell system, and batteries. The fuel cell uses hydrogen to produce electricity, with the waste products of heat and water. The electricity powers the batteries, which powers the bus.

**Greenhouse Gas Emissions:** Zero-emission buses have no harmful emissions that result from diesel combustion. Common GHGs associated with diesel combustion include carbon dioxide (CO2), carbon monoxide (CO), nitrous oxides (NOx), volatile organic compounds (VOCs), and particulate matter (PM). These emissions negatively impact air quality and contribute to climate change impacts.

**Hydrogen Fueling Station:** The location that houses the hydrogen production (if produced onsite), storage, compression, and dispensing equipment to support fuel cell electric buses.

**On-route Charging:** BEB charging while on the route. With proper planning, on-route charged BEBs can operate indefinitely, and one charger can charge multiple buses.

**Operating Range:** Driving range of a vehicle using only power from its electric battery pack to travel a given driving cycle.

**Route Modeling:** A cost-effective method to assess the operational requirements of ZEBs by estimating the energy consumption on various routes using specific bus specifications and route features.

**Useful Life:** FTA definition of the amount of time a transit vehicle can be expected to operate based on vehicle size and seating capacity. The useful life defined for transit buses is 12-years. For cutaways, the useful life is 7 years.

**Validation Procedure:** to confirm that the actual bus performance is in line with expected performance. Results of validation testing can be used to refine bus modeling parameters and to inform deployment plans. Results of validation testing are typically not grounds for acceptance or non-acceptance of a bus.

**Zero-Emission Vehicle:** A vehicle that emits no tailpipe emissions from the onboard source of power. This is used to reference battery-electric and fuel cell electric vehicles, exclusively, in this report.

**Well-to-wheel Emissions:** Quantity of greenhouse gas, criteria pollutants, and/or other harmful emissions that includes emissions from energy use and emissions from vehicle operation. For BEBs, well-to-wheel emissions would take into account the carbon intensity of the grid used to charge the buses. For FCEBs, well-to-wheel emissions would take into account the energy to produce, transport, and deliver the hydrogen to the vehicle

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

# RESOLUTION NO 2022-23-03

**RESOLUTION OF THE BUTTE COUNTY ASSOCIATION OF GOVERNMENTS APPROVING A ROLLOUT PLAN FOR THE TRANSITION TO A 100% ZERO EMISSION PUBLIC TRANSIT FLEET BY 2040**

**WHEREAS**, The Office of Administrative Law (OAL) adopted and made effective the Final Regulation Order for the Innovative Clean Transit Regulation (ICTR) produced by the California Air Resources Board (CARB) on August 13, 2019.

**WHEREAS**, Title 13 of the California Code of Regulations (CCR) amended sections 2023, 2023.1, 2023.2, 2023.3 and 2023.4, added new sections 2023.5 – 2023.11 and codified under new Article 4.3 titled Innovative Clean Transit;

**WHEREAS**, BCAG and B-Line solicited for and obtained the Center for Transportation and the Environment (CTE) to prepare a Zero Emissions Transition Study and Rollout Plan for compliance with the ICTR;

**WHEREAS**, CTE produced a Zero Emission Bus (ZEB) Master Plan with multiple scenarios and combinations utilizing fleet, fuel, maintenance, and infrastructure costs for battery electric buses (BEB) and hydrogen fuel cell buses (FCEB);

**WHEREAS**, CTE also produced a Rollout Plan identifying the majority BEB scenario as being the preferred scenario for BCAG and B-Line to comply with the ICT regulation;

**NOW THEREFORE BE IT RESOLVED** that the Butte County Association of Governments formally adopts the Rollout Plan prepared by CTE identifying the majority battery electric bus (BEB) as the preferred scenario to comply wit the ICT Regulation to transition the B-Line to a 100% zero emissions fleet by 2040.

**PASSED AND ADOPTED** by the Butte County Association of Governments on the 26th day of May 2022 by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

**APPROVED:** ____________________________________
JODY JONES, CHAIR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

**ATTEST:** __________________________________________________
JON A. CLARK, EXECUTIVE DIRECTOR
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS