Spokane Transit Authority
1230 West Boone Avenue
Spokane, WA 99201-2686
(509) 325-6000

PLANNING & DEVELOPMENT COMMITTEE MEETING
Wednesday, June 5, 2024
10:00 a.m. – 11:30 a.m.

STA Northside Conference Room
Spokane Transit Authority
1230 W. Boone Avenue, Spokane, WA
w/Virtual Public Viewing Option Link Below

AGENDA

1. Call to Order and Roll Call
2. Committee Chair Report *(5 minutes)*
3. Committee Action *(5 minutes)*
   A. Minutes of the May 1, 2024, Committee Meeting -- *Corrections/Approval*
4. Committee Action
   A. Board Consent Agenda *(20 minutes)*
      1. Wellesley High Performance Transit: Regional Mobility Grant Application Approval *(Otterstrom)*
      2. STA Moving Forward: 2024 Amendment (Resolution) *(Otterstrom)*
      3. Zero-Emission Bus Fleet Transition Plan Approval *(Rapez-Betty)*
   B. Board Discussion Agenda -- *none*
5. Reports to Committee *(40 minutes)*
   A. Connect Spokane Comprehensive Plan Update: Draft Elements Review *(Otterstrom)*
   B. Connect 2035 Strategic Plan: Workshop Preview *(Otterstrom)*
   C. 2025-2030 Transit Development Plan: Complete Draft *(Otterstrom)* *(Public Hearing at June 20, 2024, Board meeting)*
   D. I-90 / Valley High Performance Transit Corridor Development Plan: Route 7 Supplemental *(Otterstrom)*
   E. Transit-Oriented Development: Pilot Project Plan *(Otterstrom)*
6. CEO Report *(E. Susan Meyer) (15 minutes)*
7. Committee Information
   A. Division Street Bus Rapid Transit: Design and Public Outreach Update *(Otterstrom)*
8. Review July 10, 2024, Committee Meeting Draft Agenda
9. New Business
10. Committee Members' Expressions *(5 minutes)*
11. Adjourn

Next Committee Meeting: Wednesday, July 10, 2024, *(second Wednesday)* at 10:00 a.m. in person.

Virtual Link:	Join **here**		
Password:	**Members**: 2024	|	**Guests**: Guest
Call-in Number:	1-408-418-9388	|	Event #: 2496 263 7012

Agendas of regular Committee and Board meetings are posted the Friday afternoon preceding each meeting at the STA's website: www.spokanetransit.com. Discussions concerning matters to be brought to the Board are held in Committee meetings. The public is welcome to attend and participate. Spokane Transit assures nondiscrimination in accordance with Title VI of the Civil Rights Act of 1964 and the Americans with Disabilities Act. For more information, see www.spokanetransit.com. Upon request, alternative formats of this information will be produced for people who are disabled. The meeting facility is accessible for people using wheelchairs. For other accommodations, please call (509) 325-6094 (TTY Relay 711) at least forty-eight (48) hours in advance.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM __2__: COMMITTEE CHAIR REPORT

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Pam Haley, Chair, Planning & Development Committee

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SUMMARY: At this time, the Committee Chair will have an opportunity to comment on various topics of interest regarding Spokane Transit.

RECOMMENDATION TO COMMITTEE: N/A

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 3A: MINUTES OF THE MAY 1, 2024, COMMITTEE MEETING

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Vicki Clancy, Executive Assistant to the Chief Planning & Development Officer

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SUMMARY: Draft Minutes of the May 1, 2024, Planning & Development Committee meeting are attached for your information, corrections and/or approval.

RECOMMENDATION TO COMMITTEE: Corrections and/or approval.

COMMITTEE ACTION:

RECOMMENDATION TO BOARD:

FINAL REVIEW FOR BOARD BY:

Division Head __________ Chief Executive Officer ___________ Legal Counsel __________

Spokane Transit Authority
1230 West Boone Avenue
Spokane, Washington 99201-2686
(509) 325-6000

PLANNING & DEVELOPMENT COMMITTEE MEETING

DRAFT Minutes of the May 1, 2024, Meeting

STA Northside Conference Room
Spokane Transit Authority, 1230 W. Boone Avenue, Spokane, WA
w/Virtual Public Viewing Option

MEMBERS PRESENT
Pam Haley, City of Spokane Valley – *Chair*
Zack Zappone, City of Spokane
Kitty Klitzke, City of Spokane
Chris Grover, Small Cities Representative (Cheney), *Ex-Officio*
Dan Sander, Small Cities Representative (Millwood) *Ex Officio*
Dan Dunne, Small Cities Representative (Liberty Lake)
Rhonda Bowers, Labor Representative *(Non-voting)*
E. Susan Meyer, Chief Executive Officer *Ex -Officio*

STAFF PRESENT
Karl Otterstrom, Chief Planning & Development Officer
Brandon Rapez-Betty, Chief Operations Officer
Monique Liard, Chief Financial Officer
Nancy Williams, Chief Human Resources Officer
Carly Cortright, Chief Communications & Customer Service Officer
Vicki Clancy, Executive Assistant to the Chief Planning & Development Officer

PROVIDING LEGAL COUNSEL
Megan Clark, Etter, McMahon, Lamberson, Van Wert & Oreskovich, P.C.

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1. CALL TO ORDER AND ROLL CALL

   Chair Pam Haley called the meeting to order at 10:00 a.m. and Ms. Vicki Clancy conducted roll call.

2. COMMITTEE CHAIR REPORT

   Chair Haley had nothing to report at this time.

3. COMMITTEE ACTION

   A. MINUTES OF THE MARCH 27, 2024 (APRIL), COMMITTEE MEETING

   Ms. Kitty Klitzke moved to approve the March 27, 2024 (April), Planning & Development Committee meeting minutes. Chair Haley seconded, and the motion was approved unanimously.

4. COMMITTEE ACTION

   A. BOARD CONSENT AGENDA – *none*

   B. BOARD DISCUSSION AGENDA – *none*

5. REPORTS TO COMMITTEE

   A. CONNECT SPOKANE COMPREHENSIVE PLAN UPDATE: REVENUES AND FARES ELEMENT

   Mr. Otterstrom reviewed draft revisions to the Revenues & Fares Element, as well as the draft of the new Transit Equity and Inclusion Element for review and comment. STA's goal is for the fare revenue structure to appropriately balance fares paid by riders with local, voter-approved sales taxes, grants, and other revenue to provide high-quality service. Mr. Otterstrom reviewed existing policies proposed to be removed, 1.3 Advertising (no longer offered) and 2.5 Low Income Fares. Staff are proposing three new elements: 2.5 Business and Institutional Fare Programs, 2.6 Eligibility-based Fare Programs, and 2.7 Community Access Programs. Mr. Otterstrom reviewed other minor changes. Discussion ensued.

Mr. Otterstrom provided the proposed content for the draft Transit Equity and Inclusion Element, which includes moving Title VI policies to the main body of the comprehensive plan, reflecting STA's commitment to serving all residents, and recognition and acknowledgement of the Washington State Healthy Environment for All (HEAL) Act. Mr. Otterstrom reviewed the proposed introduction to the Transit Equity and Inclusion element. Mr. Otterstrom described the goals and principles for this element. Mr. Otterstrom gave a brief description of the draft policies. Mr. Otterstrom concluded his report by going over the next steps for bringing forward other draft changes. Mr. Zack Zappone inquired about public input on draft changes. Mr. Otterstrom offered to include a report on planned outreach in an upcoming committee meeting.

B. STA MOVING FORWARD: PROJECT DELIVERY AMENDMENT

Mr. Otterstrom provided a brief background on the 10-year strategic plan *STA Moving Forward* and the impetus for the Project Delivery Amendment. Mr. Otterstrom reviewed the adjustments proposed as part of the amendment. This includes changing the completion year to 2017 for the project, "Direct, non-stop peak hour service between Liberty Lake and Spokane" since the project was first implemented in 2017 and additional service is no longer warranted. It also includes adjusting the project descriptions for two other projects: 1) delivering the preliminary design and right-of-way acquisition for Appleway Station Park & Ride, and 2) addition of evening and weekend service on Route 45 Perry District. Mr. Otterstrom reviewed the Draft Appendix D, which is proposed to be added to *STA Moving Forward* through amendment. Next steps include a public hearing at the May Board meeting.

C. CONNECT 2035 STRATEGIC PLAN UPDATE: PROPOSED OUTCOMES

Mr. Otterstrom reviewed the goals of *Connect 2035,* the next 10-year strategic plan, which were identified during Phase 1 of the strategic planning effort. *Connect 2035* initiatives will represent the programs, projects, and supporting investments that are needed to deliver on the strategic goals. Mr. Otterstrom provided the framework for Connect 2035's Initiatives and Investments. It is important to recognize that the current rate of local, voter-approved sales tax of 8/10 of one percent is required to operate and maintain all investments delivered as part of *STA Moving Forward.* Effectively, these investments are assumed to be baseline requirements of *Connect 2035*. The planning effort identifies several upcoming projects as core investments. This includes Division Street Bus Rapid Transit (BRT), zero-emission fleet transition, and implementing a facilities master plan. There are opportunities for enhancements, both one-time and ongoing, that could be identified and included in the final *Connect 2035* plan. Any ongoing enhancements that are beyond current resources would need to be understood as only feasible with additional funding. STA is in an ongoing input gathering process, seeking public input through rider forums and open houses, holding listening sessions with the STA Board of Directors, conducting STA employee outreach, and utilizing technical analysis to evaluate enhancement initiatives. Mr. Otterstrom provided a list of potential initiative categories. After the list of initiatives has been compiled, the evaluation process will begin. Evaluation will ensure that proposed investments chosen and included support the strategic framework. The evaluation will identify the initiatives that deliver the most impact, offer the highest return on investment, and further the strategic goals to the greatest extent. Mr. Otterstrom described the evaluation process and timeline; the full list of initiatives will be brought to the Board at the June 5 workshop.

D. 2025-2030 TRANSIT DEVELOPMENT PLAN: PROPOSED 2025-2027 SERVICE IMPROVEMENTS

Mr. Otterstrom, in the interest of time, provided a high-level overview of the ongoing development of the 2025-2030 Transit Development Plan (TDP). Mr. Otterstrom introduced the Service Improvement Program (SIP), which is a three-year road map for service changes that is included in the TDP. It helps provide a common understanding of upcoming changes to service. Mr. Otterstrom described the three main themes for each year of the SIP, 2025 will focus on the West Plains, and? investments on High Performance Transit (HPT) routes; 2026 will focus on minor adjustments and a potential pilot of expansion into north Idaho; and 2027 will focus on Spokane Valley and Argonne Station Park & Ride implementation. Mr. Otterstrom provided a map of service requests; these were received during 2023 and such feedback informs regular system performance reviews and long-range planning. The next steps are to incorporate the draft SIP into the Draft 2025-2030 TDP for review and comment. Ms. Klitzke inquired about a possibility of expanding the Public Transportation Benefit Area (PTBA). Annexation of other areas into the PTBA is possible, there are multiple steps to this process that the Board would have to take.

E. 2025-2030 TRANSIT DEVELOPMENT PLAN: REVIEW PRELIMINARY CAPITAL IMPROVEMENT PROGRAM

In the interest of time, Ms. Liard recommended that this topic be moved to the June meeting and be presented with the full draft of the TDP.

F. 2025-2030 TRANSIT DEVELOPMENT PLAN: REVIEW FINANCIAL FORECAST

In the interest of time, Ms. Liard recommended that this this topic be moved to the June meeting and be presented with the full draft of the TDP.

G. TRANSIT ORIENTED DEVELOPMENT: PILOT PROJECT FUNDING

In the interest of time, Mr. Otterstrom recommended that this item be deferred to next month.

6. CEO REPORT

Ms. E. Susan Meyer presented the CEO Report:

Sales Tax Update: April 2024 Voter-Approved Sales Tax Revenue (February 2024 Sales). Actual ($8,280,274) compared to budget ($7,893,772) for a 4.9% difference of $386,502. Sales tax revenue is 4.9% YTD above budget ($0.8M), 4.9% above April 2023 actual ($0.4M) and 2.3% YTD above 2023 actual ($0.8M).

Bloomsday 2024: Ms. Meyer stated that the organization is prepared to do what it has always done, which is to make Bloomsday bus service a success. She reviewed the schedule for shuttle service. Given the Board's recent approval of fare free on weekends in May and June 2024, no money will be collected and those who have purchased passes in advance will be refunded.

APTA Mobility Conference: Ms. Meyer and Mr. Otterstrom attended the American Public Transportation Association (APTA) Mobility conference in Portland, Oregon, along with Mayor Grover and Council Member Speirs. During the conference, the group from STA met with Ms. Sherry Little and Mr. Mike Piper from Cardinal Infrastructure and the Federal Transit Administration (FTA), including its executive director and Region 10 administrator. FTA leadership is pleased with STA's delivery of City Line and supportive of ongoing efforts in preparing Division Street Bus Rapid Transit (BRT) for a future request for Capital Investment Grant (CIG) funding. Mayor Grover said STA was very well received, that FTA is impressed by how well STA had done in keeping City Line under budget, which sends a very positive message.

Zero-Emission Fleet Transition Plan Workshop: This will take place on Friday and breakfast will be provided. The consultant from Center for Transportation and the Environment (CTE) and Mr. Rapez-Betty will be leading the presentation and discussion about the evaluations of the battery electric buses and hydrogen fuel buses.

7. COMMITTEE INFORMATION – *none*

8. REVIEW June 5, 2024, COMMITTEE MEETING AGENDA

9. NEW BUSINESS - *none*

10. COMMITTEE MEMBERS' EXPRESSIONS

Related to the comprehensive plan, Mayor Grover opined that, while it is good to look at other plans prepared by other agencies, with the expertise of those in the room, we can develop a comprehensive plan that other agencies are going to want to see. Regarding expanding the PTBA, he reminded the Board that we still have underserved areas within the PTBA that should be focused on and Chair Haley added that she agreed. There is a reason STA was one of two agencies she is aware of that completed huge projects under budget, which is impressive.

11. ADJOURN

With no further business to come before the Committee, Chair Haley adjourned the meeting at 11:31 a.m.

NEXT COMMITTEE MEETING: WEDNESDAY, June 5, 2024, at 10:00 a.m. in person at STA Northside Conference Room.

Respectfully submitted,

Vicki Clancy

Vicki Clancy, Executive Assistant
Planning & Development Department

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 4A1 : WELLESLEY HIGH PERFORMANCE TRANSIT: REGIONAL MOBILITY GRANT APPLICATION APPROVAL

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Tara Limon, Principal Transit Planner

SUMMARY: Staff are seeking Board approval to submit a grant application to the State Regional Mobility Grant program for the Wellesley High Performance Transit (HPT) line in the amount of approximately $7.46 million.

BACKGROUND: The Washington State Regional Mobility Grant (RMG) program supports local efforts to improve regional connectivity through public transportation. STA has successfully implemented a number of projects with funding through the RMG program, including City Line, Route 4 Monroe-Regal HPT, Moran Station Park and Ride, and West Plains Transit Center. Current projects funded through the competitive grant program include Sprague HPT, I-90/Valley HPT Infrastructure, Argonne Station Park and Ride, and Cheney HPT Infrastructure.

The Washington State Department of Transportation (WSDOT) announced the timeline for RMG applications for funding beginning with the 2025-2027 biennial budget. This includes a pre-application process to ensure eligibility and coordination, followed by a complete application, due June 25, 2024. A minimum of 20% local match is required for each grant application. Following the review of an independent evaluation panel, WSDOT plans to forward a prioritized list of projects to the Legislature and the governor in November 2024 for consideration in the 2025 legislative session.

Route 33 Wellesley is one of STA's busiest routes, traveling between Spokane Community College (SCC) and Spokane Falls Community College (SFCC), primarily along Wellesley Avenue, with significant segments on Market Street, Driscoll Boulevard, and Whistalks Way. In addition to the community colleges, Route 33 serves Shadle Shopping Center, Northtown Mall, Shadle Park High School and Rogers High School. It also intersects all north-south bus routes in north Spokane, including Route 25 Division, which is currently slated to be replaced with the Division Street Bus Rapid Transit (BRT) project in 2030. There are approximately 44,500 residents and 13,300 jobs within a half mile of the Wellesley corridor.

Route 33 operates on a schedule comparable to Route 4 Monroe-Regal, with trips every 15 minutes for most times on weekdays, and generally every 30 minutes at all other times. Night and weekend service was improved as part of *STA Moving Forward.* Route 33 served over a half-million passengers in 2023. Since 2010, the corridor has been included in the High Performance Transit Network element of *Connect Spokane*, even though it was not committed for full implementation in *STA Moving Forward*.

With service levels now comparable to other HPT routes, the proposed project's purpose is to improve passenger amenities to attract even higher ridership, improve reliability, and provide enhanced connectivity to the area. In addition to being identified in STA's comprehensive plan *Connect Spokane* (see High Performance Transit, pg. 25), the corridor is identified in the region's metropolitan transportation plan, Horizon 2045 (see Upcoming Public Transit Initiatives, pg. 69). In keeping with other HPT corridors, plans have reserved the route number "3" when physical improvements signal the transformation of the corridor to HPT.

The project is an excellent candidate initiative for *Connect 2035*. While the grant application precedes the evaluation process planned for in the *Connect 2035* strategic planning effort, staff believe it is timely to advance the request to ensure improvements can be in place to support connectivity with the future Division Street BRT project. Submission of the application would not preclude the Board from completing a review within *Connect 2035,* since the expected adoption date of the Board's new ten-year strategic plan precedes a funding decision by the Legislature.

Project costs are preliminary estimates and may be revised as details are fully defined. Similarly, the RMG request may be adjusted in the final application. Like other HPT corridors, the project is anticipated to extend over two biennia, to include planning, design and construction, with substantial completion projected in late 2028. The implementation of HPT along this route will include reliability treatments such as stop location adjustments and near-level boarding at busy stops. The project as proposed will also include passenger improvements such as ADA accessible boarding and alighting pads, shelters, benches, trash and recycling bins, lighting, STA branded amenities, and real-time information at major stops. The corridor is envisioned to enhance regional mobility, supporting neighborhoods and destinations not directly served by BRT corridors such as City Line and Division Street.

Below is the current cost estimate for the project, which is included in the draft 2025-2030 Transit Development Plan.

Project	**RMG Request** ***(subject to revision)***	**Local Match (Proposed)**	**Total Estimated Cost**
Wellesley HPT	$7,460,000	$1,865,000	$9,325,000

The draft 2025-2027 Capital Improvement Program identifies $1,865,000 matching funds for the project from projected local funding. Because Wellesley HPT was not included in the Board-approved 2024-2029 Capital Improvement Program, Board authorization is required to submit the grant application.

RECOMMENDATION TO COMMITTEE: Recommend the Board of Directors approve submittal of a Washington State Regional Mobility Grant application for approximately $7.46 million for the Wellesley High Performance Transit project.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 4A2 : STA MOVING FORWARD: 2024 AMENDMENT (RESOLUTION)

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Mike Tresidder, Senior Transit Planner

SUMMARY: Staff have prepared a proposed amendment for Committee consideration to the *STA Moving Forward ten-year strategic plan* to adjust several projects within that plan as it relates to their general scope description and/or timeline. The purpose of today's action is to recommend to the Board adoption by resolution of the amendment to *STA Moving Forward* to support implementation of the projects and completion of all projects in the plan.

BACKROUND: Over the past two years, this Committee and the STA Board of Directors have been engaged in preparing STA's next ten-year strategic plan, *Connect 2035*. Earlier in Phase 2 of that effort, STA's consultants conducted a fixed route network assessment that reviewed the performance of existing service and identified opportunities for improvement. In reviewing the findings of that work with the Board on March 6, 2024, the project team identified two paths for the agency to pursue to address emerging needs and deliver a transit system that connects everyone to opportunity. Action Pathway #1 was to complete delivery of *STA Moving Forward* and 2021 board-identified Near Term Investments, with some warranted adjustments as embodied in the proposed amendment.

On April 10, 2024, staff introduced the scope of a proposed amendment that would adjust three projects within the plan. On May 1, 2024, staff reviewed the draft amendment with the Committee which was then the subject of a duly noticed public hearing before the Board of Directors on May 16, 2024.

The attached draft resolution includes the recommended "Appendix D" to *STA Moving Forward* and together represent the proposed *STA Moving Forward* 2024 amendment. Two projects have revised scope descriptions, while the third recognizes the 2017 service improvements as the consummation of the project commitment.

RECOMMENDATION TO COMMITTEE: Recommend the STA Board of Directors adopt, by resolution, the STA Moving Forward 2024 Plan amendment.

RESOLUTION NO. _________

A RESOLUTION FOR THE PURPOSE OF AMENDING STA MOVING FORWARD: A PLAN FOR MORE AND BETTER TRANSIT SERVICES

SPOKANE TRANSIT AUTHORITY
Spokane County, Washington

BE IT RESOLVED BY THE SPOKANE TRANSIT AUTHORITY as follows:

WHEREAS, the Spokane Transit Authority (STA) is a municipal corporation operating and existing under and pursuant to the Constitution and Laws of the State of Washington, including RCW Title 36, Chapter 57A, Public Transportation Benefit Area; and,

WHEREAS, the STA Board of Directors adopted by resolution no. 727-14 a plan entitled *STA Moving Forward: A Plan for More and Better Transit Services* ("the Plan"); and,

WHEREAS, the Plan sets forth objectives for maintaining and expanding the transit system, including fixed-route bus, paratransit and vanpool service in order to connect the community to public services, improve travel flow by connecting jobs and workers and partner in advancing regional economic development; and

WHEREAS, the Plan was amended by Resolution 744-16 on June 16, 2016 to reflect changed assumptions related to the timing and sequence of projects in the Plan; and,

WHEREAS, the primary funding source of the Plan, in the form of an additional 2/10 of 1% sales tax, was approved by area voters on November 8, 2016 through ballot proposition submitted by the STA Board of Directors in resolution no. 742-16; and

WHEREAS, since the approval of the additional sales tax, STA has implemented many projects contained within the Plan; and

WHEREAS, due to the changed conditions, including the COVID-19 pandemic and unknown regional economic consequences, the Plan was amended by Resolution 781-20 on November 19, 2020; and

WHEREAS, due to the analysis of the fixed route network completed in 2024, and due to the latest ridership demands and opportunities, the general scope description or timeline for three projects identified int the plan should be updated; and

WHEREAS, the STA Board of Directors conducted a duly noticed public hearing on May 16, 2024, concerning a proposed amendment to the Plan, reflecting adjustments and other revisions to more accurately reflect the implementation of improvements identified in the Plan;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of STA as follows:

<u>Section 1.</u> Exhibit A to this resolution is hereby amended into the *STA Moving Forward* plan as Appendix D.

<u>Section 2.</u> This resolution shall take effect and be in force immediately upon passage.

ADOPTED by STA at a regular meeting thereof held on the 20th day of June 2024.

Attest:

____

Dana Infalt
Clerk of the Authority

____

All French
STA Board Chair

Approved as to form:

____

Megan Clark
Legal Counsel

EXHIBIT A

Appendix D – 2024 Amendment to *STA Moving Forward*

The table below amends the scope and/or timeline of identified projects. The left-most column represents the project descriptions found in Appendix C of *STA Moving Forward*. The "Revised Project Descriptions" column details the revisions to each project description.

***STA Moving Forward* Appendix C Project Description**	**Revised Project Description**	**Appendix C Targeted Year for Project Completion**	**Revised Targeted Year for Project Completion**
Direct service between Logan and Lincoln Heights neighborhoods	**Provide improved evening and/or weekend service on Route 45 Perry District in order to increase mobility and access on the South Hill**	2025	2025
Expand commuter parking capacity east of Sullivan Road (Barker to Stateline) *(I-90/Valley HPT Infrastructure)*	**Acquire property for Appleway Station Park & Ride for expansion of commuter parking capacity east of Sullivan Road (Barker to Stateline)**	2025	2025
Direct, non-stop peak hour service between Liberty Lake and Spokane (*I-90/Valley HPT service element)*	*(No changes to project description)*	2025	**2017**

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 4A3 :	ZERO-EMISSION BUS FLEET TRANSITION PLAN APPROVAL
REFERRAL COMMITTEE:	n/a
SUBMITTED BY:	Brandon Rapez-Betty, Chief Operations Officer Christian Bigger, Zero-Emission Fleet Transition Manager

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SUMMARY: Staff are seeking the Committee's recommendation to the Board to approve the Zero-Emission Bus Fleet Transition Plan. During the Committee meeting, staff will also present a summary of the content and key takeaways of the Zero-Emission Fleet Transition Board Workshop held on May 3, 2024.

BACKGROUND: The Spokane Transit (STA) Board of Directors held a Zero-Emission Transition Plan Workshop at CenterPlace Regional Event Center in Spokane Valley on May 3, 2024. Staff and STA consultants from the Center for Transportation and the Environment (CTE) presented information about the agency's planning, implementation, and projections for its transition to zero-emission propulsion systems, with particular focus on transition of the Fixed Route bus fleet.

The workshop's objectives included:

- Review STA's zero-emission transition history
- Understand the legislative requirements and guidance for zero-emission transition
- Examine battery-electric bus (BEB) performance compared to original projections
- Identify zero-emission opportunities and challenges
- Outline STA's framework for near and long-term decision making
- Schedule the approval of STA's Zero-Emission Bus Fleet Transition Plan (June Board cycle)

Staff presented the following findings:

- STA's fleet transition strategy is guided by Washington State RCWs/WACs, STA Board decisions, and CEO staff directives.
- With 40 BEB's, or ~25% of the fleet, STA's Boone Northwest Garage is at capacity for storage space and electrical power availability.
- Further fleet expansion will require a combination of new facility space, propulsion infrastructure, and funding beyond local resources.
- Considering the documented limitations, STA's Fixed Route Fleet Replacement Plan presented in the draft 2025-2030 Transit Development Plan outlines diesel purchases through 2029 in anticipation of additional zero-emission facility space and infrastructure to be in place after 2029.
- The Fixed Route Fleet Replacement Plan and projections going beyond 2030 assume all zero-emission bus purchases beginning in 2030 and full fleet conversion by 2045.
- STA is committed to low-emissions transition and further exploration of carbon reduction practices while purchasing diesel buses through 2029.

The full draft Zero-Emission Bus Fleet Transition Plan is attached. The draft plan represents an update on analysis that was completed in 2020 and informed the introduction of the first 40 battery electric buses into STA's fleet. The plan was not formally approved at the time, but its findings and recommendations were integrated into various board decisions including vehicle procurements and multiple editions of the TDP. Note that several updates to fleet count and composition will be made prior to Board approval to ensure alignment with the draft 2025-2030 Transit Development Plan. The minor revisions will not alter the strategies or conclusions outlined in the draft.

RECOMMENDATION TO COMMITTEE: Recommend the Board approve STA's Zero-Emission Bus Fleet Transition Plan.

Zero-Emission Bus

Transition Study Update

Prepared: June 2023

Updated: April 2024

Prepared by:

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Executive Summary

The Spokane Transit Authority (STA) contracted the Center for Transportation and the Environment (CTE) to update the previously prepared *Analysis of Alternatives for Fleet Conversion to Zero-Emission Technologies* to evaluate transitioning STA's fixed-route service to zero-emission technology. The original study was completed to understand the transition lifecycle costs required to achieve a zero-emission fleet, including evaluation of the total cost of ownership as well as help STA understand the challenge and manage the constraints associated with a full-fleet transition to zero-emission buses (ZEBs). The analysis considered both operational and financial impacts of ZEB technologies that were considered commercially available during the time period of the study (through 2040). In late 2022, STA contracted CTE to update the ZEB study assumptions that may have changed over the last three years based on improvements in technology, changes to costs, changes to STA service, etc. and revise the analysis. Results from this updated analysis are included in this *Zero Emission Bus Transition Study Update*. In addition, the update includes elements for a transition study required by the FTA to be eligible for federal funding.

Zero-emission technologies considered include both battery electric buses (BEBs) 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 difference between BEBs and FCEBs, however, is the amount of battery storage and how the batteries are recharged. The energy supply in a BEB comes from electricity provided by an external source, typically the local utility grid, which is used to recharge the batteries. The energy supply for an FCEB is completely on-board, where hydrogen is converted to electricity using a fuel cell. The electricity from the fuel cell is used to recharge the batteries.

CTE worked closely with STA staff throughout both projects to develop the approach, define the assumptions, and confirm the results. The approach for this study is based on the creation and analysis of four transition scenarios. The baseline utilizes STA's updated procurement plan (May 2023) while the goal of the other fleet transition scenarios was to approach 100% zero emission buses by 2045.

- Baseline: Current Technology – Utilizes existing planned procurements of ZEBs (40 by the end of 2023). All other replacements moving forward assumed to be diesel for comparison except for planned BEB Bus Rapid Transit (BRT) service.
- Scenario 1: Depot Charged BEBs Only – Mixed fleet of BEBs and Internal Combustion Engine (ICE) based on block feasibility.
- Scenario 2: Depot Charged BEBs and FCEBs – Mixed fleet of BEBs and FCEBs based on block feasibility.
- Scenario 3: FCEBs Replacements Only (Original BEBs) – All BEBs in original Baseline will remain BEB; all others replaced with FCEBs.

The Baseline scenario assumes that no change is made from currently planned technologies and procurements. The Baseline scenario is used to compare the incremental costs of deploying ZEBs in the other scenarios. Each scenario uses a set of assumptions for improvements in battery storage capacity and efficiency, ultimately yielding improvements in bus range. In addition, the scenarios incorporate the current fleet procurement schedule as of May 2023, the planned phasing-out of diesel-hybrid vehicles, and BEB deployments for Central City Line (CCL) and Monroe Regal Line (MRL) regardless of other vehicle technologies employed.

The underlying basis for the assessment is CTE's ZEB Transition Planning Methodology, including route, charge and rate modeling. This methodology allows CTE to assess energy efficiency and energy consumption. This information can then be used to project the range of given vehicle technologies. CTE previously collected data from seventeen (17) STA routes, including the proposed CCL and MRL alignments and used bus specifications for vehicles that STA was considering purchasing to estimate range and energy consumption for all of STA's routes and blocks. Nominal and strenuous range at beginning-of-life and end-of-life batteries were developed. In 2023, CTE utilized the existing modeling results from 2020 and data collected during initial BEB deployments to update the analyses.

Once estimates for vehicle efficiency, range, and energy consumption were established, CTE completed the following assessments to develop cost estimates for each transition scenario.

1. Service Assessment
2. Fleet Assessment
3. Maintenance Assessment
4. Charging Analysis
5. Fuel Assessment
6. Facilities Assessment
7. Emissions Assessment

These assessment results yield a total cost of ownership for each transition scenario over the transition period (2024 – 2045). The total cost of ownership for all scenarios is summarized in the table and figure below.

Table E1: Total Cost of Ownership for ZEB Transition (202 2045)

Category	Baseline	BEB Depot Only	Depot BEB and FCEB	FCEB Replacements Only
Fleet	$358M	$465M	$492M	$526M
Maintenance	$293M	$277M	$277M	$277M
Fuel	$120M	$87M	$112M	$189M
Infrastructure	$5M	$25M	$22M	$18M
Total	**$776M**	**$854M**	**$903M**	**$1,009M**
Compared to Baseline	-	$78M	$127M	$233M
% ZEB Fleet	32%	95%	100%	100%

Figure E1: Total Cost of Ownership for ZEB Transition (2024 - 2045)

Section 1 - Introduction

Founded in 1980, the Spokane Transit Authority (STA) provides transit services to the city of Spokane, Washington and surrounding urban areas, serving a population of approximately 499,000 across 248 square miles. The agency provides services across multiple transportation formats, including fixed-route bus service, paratransit, and vanpool. The fixed-route bus service consists of 52 routes served by a fleet of 164 buses of various lengths and configurations.

In 2019, STA contracted the Center for Transportation and the Environment (CTE) to conduct a study to evaluate transitioning STA's fixed-route service to zero-emission technology. The study also included a detailed evaluation of two specific planned service expansions/modification, the Central City Line (CCL) and Monroe-Regal Line (MRL). The CCL was being developed as a 6-mile, all-electric, Bus Rapid Transit (BRT) service that will operate from Browne's Addition and Spokane Community College (SCC) through Downtown Spokane and the University District. The project was awarded $53.4 million in Small Starts Grant funding from the U.S. Department of Transportation Federal Transit Administration (FTA). The service was originally scheduled to begin in May 2022 but is now scheduled to begin on July 15, 2023 under the name "City Line." The detailed CCL analysis is included in the *Central City Line Zero-Emission Bus Deployment Implementation Plan* (CTE, May 2019) with updates to the charging analysis included in this report.

The MRL is an 11.4-mile service that operates from STA's Five Mile Park & Ride to the Moran Station, a new facility constructed as part of the project. Service started in late 2019 and is currently operating with up to four BEBs. Detailed MRL analysis is included in the *Monroe-Regal Line Zero-Emission Bus Deployment Implementation Plan* (CTE, July 2019) with updates to the charging analysis included in this report.

The original transition study was completed to understand the transition lifecycle costs required to achieve a zero-emission fleet, including evaluation of the total cost of ownership as well as help STA understand the challenge and manage the constraints associated with a full-fleet transition to zero-emission buses (ZEBs). The analysis considered both operational and financial impacts of ZEB technologies that were considered commercially available during the time period of the study. In late 2022, STA contracted CTE to update the ZEB study assumptions that may have changed over the last three years based on improvements in technology, changes to costs, changes to STA service and plans, etc. and revise the analysis. Results from this updated analysis are included in this *Zero Emission Bus Transition Study Update*. In addition, the update includes elements for a ZEB transition study required by the FTA to be eligible for federal funding programs.

Zero-emission technologies considered in this updated study included both BEBs 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 difference between BEBs and FCEBs, however, is the amount of battery storage and how the batteries are recharged. The energy supply in a BEB comes from electricity provided by an external source, typically the local utility grid, which is used to recharge the batteries. The energy supply for an FCEB is completely on-board, where hydrogen is converted to electricity using a fuel cell. The electricity from the fuel cell is used to recharge the batteries. Illustrated below is the electric drive components and energy source for a BEB and FCEB.

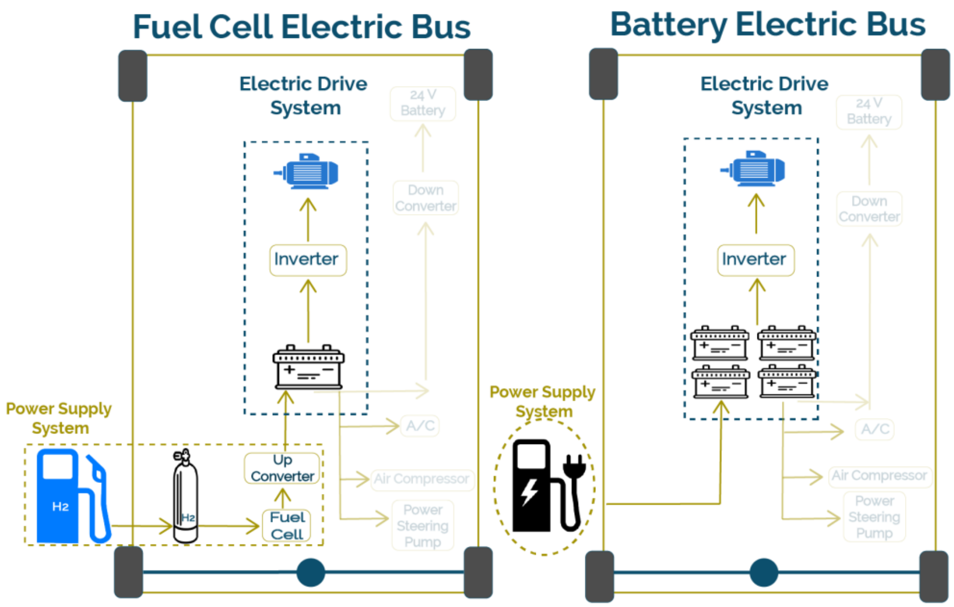


Figure 1: Schematic of ZEB Technologies

There are considerations and limitations associated with each technology. One of the primary limitations of BEBs is overall energy storage capacity. Although BEBs are approximately four times more efficient than diesel vehicles, the total amount of energy that can be stored on board without adding excessive weight is still considerably less than diesel. That means that using current technology, the overall BEB range on one charge is less than the range of a diesel vehicle on one tank of fuel. Range limitations can be mitigated by the use of the appropriate charging technologies and strategies, and this is a very important element in the planning for any BEB deployment, especially when considering a full fleet transition.

Furthermore, battery and charging technologies are changing at a rapid pace, hence the need to update the original transition study. The trends toward higher battery energy densities and increasingly sophisticated software-based charge management methodologies are expected to improve the range of BEBs to levels more comparable with traditional diesel vehicles over time. New charging vendors continue to enter the marketplace, offering various charger configurations and charge rates that help agencies customize a charging strategy and reduce operational risk associated with BEB deployments. Regardless of which battery technology or chemistry is utilized, all high voltage vehicle batteries in the market today degrade over time. Therefore, the impact on performance over time and associated battery warranties should be reviewed to optimize operations and further reduce risk.

Finally, lifecycle costs of electricity and overall infrastructure represent significant investments. Charging an entire fleet of buses can require a substantial real estate footprint and associated upfront cost to purchase and install the required equipment, not to mention the appropriate training and ongoing operational requirements.

There are similar considerations in FCEB deployment in that the infrastructure footprint can be substantial and since battery technology is also utilized there are similar concerns with degradation and end-of-life performance. Current FCEBs do have a range that is longer than BEBs and more similar to traditional diesel or CNG buses, so theoretically there will be less operational risk due to fueling strategies when incorporating FCEBs into a fleet. However, both the upfront cost of FCEB vehicles and the cost of fuel are currently higher than with their BEB counterparts (hydrogen vs. electricity). Finally, there are still a limited number of demonstrations of FCEBs to learn from partly because BEB charging technology is easier to scale and deploy to small fleets (which has been a large part of BEB deployment activity to date).

The *Zero Emission Bus Transition Plan Update* is arranged in the following sections:

- Section 1 – Introduction
- Section 2 – Policy Assessment
- Section 3 – Transition Planning Methodology
- Section 4 – Transition Scenarios and Assumptions
- Section 5 – Baseline Data
- Section 6 – Service Assessment
- Section 7 – Fleet Assessment
- Section 8 – Maintenance Assessment
- Section 9 – Charging Analysis
- Section 10 – Fuel Assessment
- Section 11 – Facilities Assessment
- Section 12 – Emissions Assessment
- Section 13 – Total Cost of Ownership
- Section 14 – Funding Needs Assessment
- Section 15 – Partnership Assessment
- Section 16 – Workforce Analysis
- Section 17 – Conclusions and Recommendations
- Section 18 – References

As discussed previously, the original ZEB study was initiated in 2019 and completed in 2020 and reflected the state of technology at the time that it was prepared. The study was updated to reflect the state of technology as of 2023 with the understanding that the transition to a full ZEB fleet is expected to take over 20 years to complete. As with the previous evaluation, CTE recommends that the study be reviewed and updated periodically to reflect the latest state of technology development, costs, regulatory environment, service requirements, and supply chain to ensure that STA continues to meet their mission in the most effective and efficient way possible.

Section 2 - Policy Assessment

Policy Assessment Overview

Policies and regulations supporting the transition to zero-emission are proliferating as the efforts to decarbonize the transportation sector expand. STA is monitoring the implementation of relevant policies and legislation. While relevant funding programs are considered, policies and regulations that direct aspects of zero-emission transit deployments beyond funding are considered in this section. STA will thoroughly assess all relevant policies and legislation throughout the fleet transition.

Alignment with Federal Priorities and Policies

With the passage of the *Bipartisan Infrastructure Law* and *Executive Order 14008: Tackling the Climate Crisis at Home and Abroad*, the federal government has set a renewed focus on zero-emission transit. STA's goal to transition to 100% zero-emission supports the federal administration priorities of safety, modernization, climate, and equity for public transportation.

Washington Policies & Goals

In 2021, the Washington State legislature enacted two statutes intended to reduce greenhouse gas emissions by 95% by 2050. The Climate Commitment Act (CCA) caps and reduces greenhouse gas emissions from Washington's largest emitting sources and industries, allowing businesses to find the most efficient pat to lower carbon emissions. The CCA puts environmental justice and equity at the center of climate policy and will use funds from the auction of emission allowances for investment in climate-resilient infrastructure including clean transportation. The Clean Fuel Standards, approved by the legislature in 2021, and adopted in November 2022 (effective January 1, 2023) reduces annual transportation emissions statewide by 20% over the next 12 years. This equates to approximately 4.3 million metric tons of carbon dioxide removed, or permanently removing 900,000 cars from the road.

Finally, under the Zero-Emission Vehicle Standard (WAC 173-423-07, December 2022), the state of Washington adopted additional vehicle emission standards to increase the sale of new zero-emission vehicles including passenger cars, light-duty trucks, and medium-duty vehicles to 100% starting in 2035. This ruling requires the state of Washington to meet California vehicle emission standards for on-road vehicles over 8,500 GVWR.

Support for Local Policy Goals

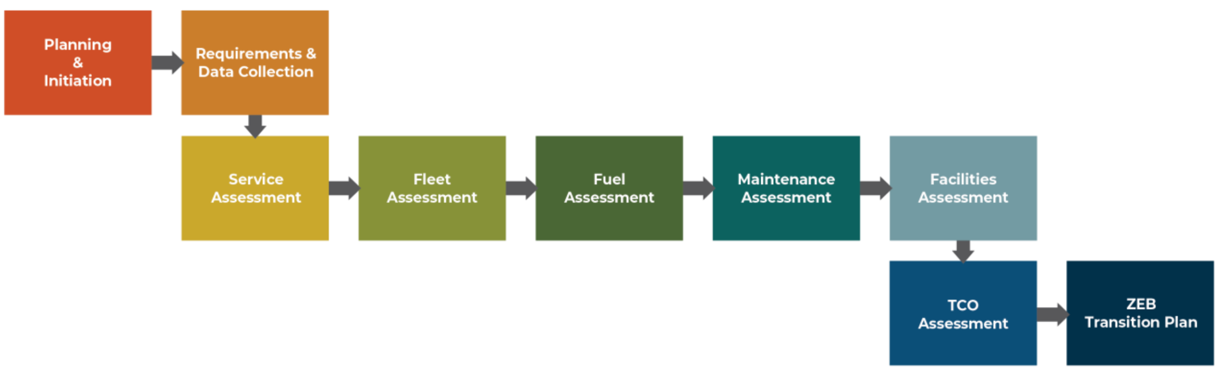
The City of Spokane approved a Sustainability Action Plan in October 2021. The Plan has three goals: 1) reduce GHG emissions by 95% (from 2016 levels) by 2050; build a community and economy that are resilient to climate change; and prioritize people who are most at risk of health and financial impacts. Previously in 2018, the City adopted a goal of 100% renewable electricity by 2030. This goal has been superseded by the State of Washington's passage of the Clean Energy Transformation Act in 2019 that now requires 100% clean energy by 2045.

Section 3 - Transition Planning Methodology

The study completed in 2020 as well as this update used CTE's Transition Planning Methodology, which is a complete set of analyses used to inform agencies in converting their fleets to zero-emission. The methodology consists of data collection, analysis and assessment stages; these stages are sequential and build upon findings in previous steps. Steps specific to this study are outlined below:

1. Planning and Initiation
2. Service Assessment
3. Fleet Assessment
4. Fuel Assessment
5. Maintenance Assessment
6. Facilities Assessment
7. Total Cost of Ownership Assessment

Figure 2: ZEB Transition Study Methodology



The **Planning and Initiation** phase builds the administrative framework for the transition study. During this phase, the project team drafted the scope, approach, tasks, assignments and timeline for the project. CTE worked with STA staff to plan the overall project scope and all deliverables throughout the full life of the study. During the kickoff meeting CTE met with stakeholders and collected updated route, block, fleet, operational, maintenance, and facilities information from STA staff to form the baseline scenario.

The **Service Assessment** phase initiated the data collection and technical analysis of the study. CTE met with STA to update the assumptions and requirements used throughout the study and to collect operational data (Requirements & Data Collection). CTE utilized results from the previously completed route modeling work as well as results from current BEB operations on STA blocks to update the service assessment. The results from the Service Assessment were used to guide ZEB procurements in the Fleet Assessment and determine energy requirements (Depot Charging, On-Route Charging and/or Hydrogen) in the Fuel Assessment. In the updated assessment, the outputs of the modeling were updated based on changes to battery capacity assumptions. A 5% improvement in battery capacity every two years, a usable capacity of 90% of the nameplate capacity, an End of Life (Warranty) capacity at 80% of usable capacity, and the 2020 route modeling efficiency results were used in the Service Assessment.

The **Fleet Assessment** analyzed the capabilities of the current ZEB technologies to meet STA's service requirements. The analysis projected the timeline for replacement of diesel and diesel-hybrid buses with BEBs and FCEBs consistent with STA's fleet replacement plan (updated as of May 2023). The Fleet Assessment also includes an assessment of projected fleet procurement costs over the transition lifetime. The assumed STA's fleet size would increase to a total of 187 vehicles during the transition period (by 2045). The analysis assumed a 15 year vehicle life.

The **Fuel Assessment** analyzed annual fueling requirements and developed cost estimates based on current and proposed electrical rate structures provided by Avista, the local electrical utility, as well as estimates for hydrogen fuel costs. These costs were compared to the expected costs to refuel diesel (and diesel-hybrid) vehicles based on current and projected fuel costs. The electrical rate structure used for updated analysis was Schedule 23 EV Rates.

The **Maintenance Assessment** analyzed labor and materials costs for maintenance over the transition period as well as major component replacements for each technology type.

The **Facilities Assessment** defined the requirements for charging and hydrogen fueling infrastructure including operational impact and utility service requirements. CTE developed estimates for equipment and infrastructure, design, construction, and installation costs, space and sitting requirements. CTE evaluated the requirements for upgrading STA's facilities to be compatible with hydrogen and determine the requirements for any hydrogen refueling stations needed to support the fleet. It was assumed that STA has reached maximum capacity of 40 BEBs at the Northwest Boone Garage and the Main Garage based on electricity capacity constraints. As such, a new storage and maintenance facility for additional BEB charging or hydrogen fueling was assumed in the analysis (to be constructed by 2029).

The **Emissions Assessment** was updated based on the revised fleet information. The analysis was completed to estimate the emissions associated with the fleet assessment scenarios in terms of number of diesel gallons reduced, and carbon production, reduction, and net savings.

The **Total Cost of Ownership Assessment** summarizes the costs of annual bus procurements, operation and maintenance costs, and infrastructure and facility upgrades over the transition period.

Section 4 - Transition Scenarios and Assumptions

Transition Scenarios

The following scenarios were assumed for the updated transition assessment:

- Baseline: Current Technology – Utilizes existing planned procurements of ZEBs (40 by the end of 2023). All other replacements moving forward assumed to be diesel for comparison except for planned BEB BRT service and three additional vehicles (2029).
- Scenario 1: Depot Charged BEBs Only – Mixed fleet of BEBs and ICE based on block feasibility.
- Scenario 2: Depot Charged BEBs and FCEBs – Mixed fleet of BEBs and FCEBs based on block feasibility.
- Scenario 3: FCEBs Replacements Only (Original BEBs) – All BEBs in original Baseline will remain BEB; all others replaced with FCEBs.

Assumptions

Due to the inherent nature of varying conditions over the period of a long-term fleet transition, it is necessary to establish a number of simplifying assumptions in a study such as this. These assumptions were developed based on discussions between CTE and STA during the **Planning & Initiation** stage of this project and include the following:

- Transition to a 100% ZEB fleet by 2045, if possible
- STA will increase fleet size to 187 vehicles during the transition period; this is inclusive of new vehicles that will be purchased to support further service expansion.
- Current fleet composition (as of the time of this study) used for the baseline scenario
- Currently planned procurement schedule (as of May 2023)
- 15-year bus lifespan assumed for future vehicles purchased
- Costs are expressed in terms of 2023 dollars with 3% escalation and ICE and ZEB bus costs are based on Washington State Procurement Contract (2023 updated costs)
- 5% improvement in battery technology every two years
- Usable capacity estimated at 90% of nameplate capacity. End of Life (warranty) estimated at 80% of usable capacity.
- Estimated maximum range of 350 miles for FCEBs

Other operational assumptions associated with the current fleet replacement schedule and vehicle technology include the following:

- In the BEB transition, current 29-foot buses will be replaced with 40-foot buses.
- STA will not purchase any additional diesel-hybrid vehicles
- Current battery sizes for BEBs and fuel tank sizes for FCEBs are based on existing specification for vehicles that have completed Altoona Testing
- A 5% improvement in battery (for BEB) and fuel tank (for FCEB) capacity every two years
- A battery replacement will occur at the mid-life (7.5 years) of each BEB

Current BEB technologies have range limitations relative to diesel vehicles, and as a result, it is not always possible to replace an agency's current fleet one to one using BEBs. Improvements are expected to be made over time, but there are significant challenges to overcome, and the timeline to achieve the goal is uncertain. In addition to the uncertainty of technology improvements, there are other risks to consider. Although current BEB range limitations may be remedied over time as a result of advancements in battery energy density and more efficient components, battery degradation may re-introduce range limitations as a risk to an all-BEB fleet over time. In emergency scenarios that require use of BEBs, agencies may face challenges supporting long-range evacuations and providing temporary shelters in support of fire and police operations. Furthermore, fleetwide energy service requirements and power redundancy and resiliency may be difficult to achieve at any given depot in an all-BEB scenario. Higher capital equipment costs and availability of hydrogen may constrain FCEB solutions.

Section 5 - Baseline Data

It is essential to understand the key elements of STA's service to evaluate the costs associated with a full-ZEB transition. Key data elements of the existing STA service was provided by STA staff and include the following:

- Fleet composition
- Routes and blocks
- Mileage and fuel consumption
- Maintenance costs

Fleet

At the time of the updated evaluation, STA's bus fleet consists of 164 vehicles of various lengths and fuel types that provide service for 40 fixed-routes, with tracked data for 25 additional trip destinations. The number of vehicles is based on the vehicles that will be in the fleet at the end of 2023. The following table provides a breakdown of the existing fleet vehicles by length and fuel type.

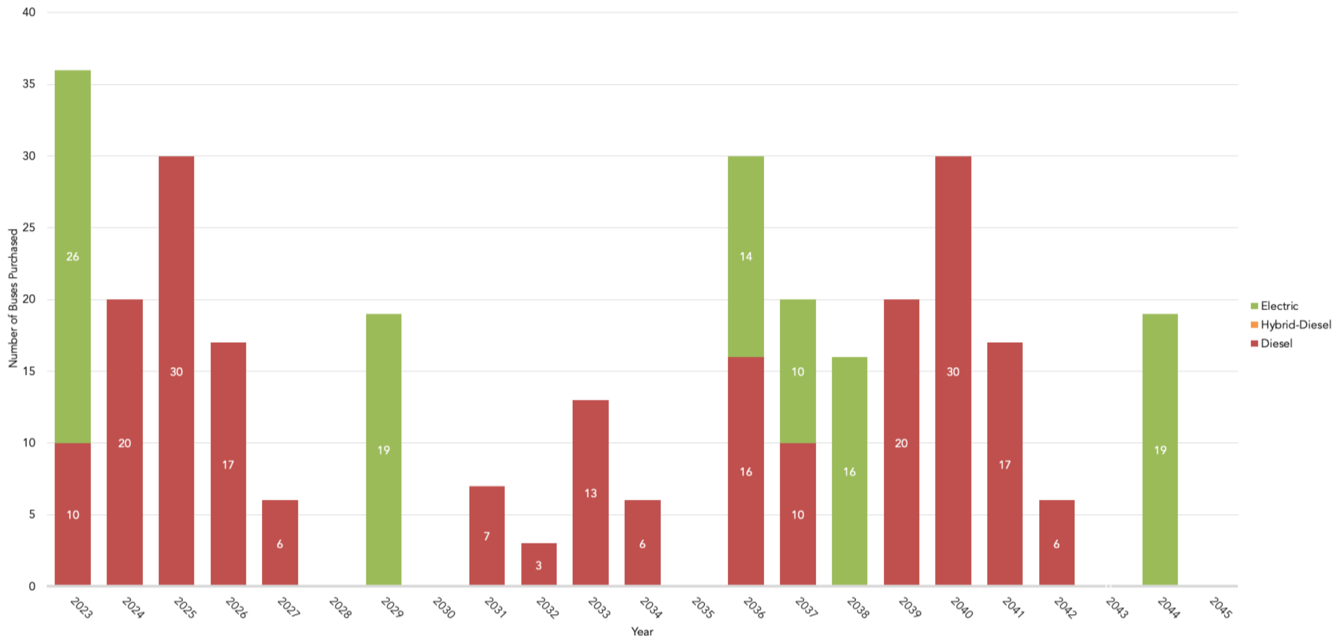
Table 1: Bus Quantity by Length and Fuel Type – End of 2023

Vehicle Length	Diesel	Diesel Hybrid	Battery Electric	Fleet Total
29'	—	3	—	3
35'	—	—	3	6
40'	80	21	23	121
60'	20	—	14	34
TOTAL	***100***	***24***	***40***	***164***

All service operates out of the Main Garage, located at 1229 West Boone Avenue, or the newly constructed Northwest Boone Garage, located immediately across West Boone Avenue from the Main Garage. Although they are separate buildings, due to their proximity they are considered the same destination for route modeling and energy evaluation purposes.

STA's goal is to maintain buses for 15 years before retirement. **Figure 3** depicts the annual bus replacement schedule (as of May 2023) throughout the transition period, regardless of scenario or technology type.

Figure 3*: *Bus Replacement Schedule



Routes and Blocks

STA's fixed-route bus service in the summer consists of 52 routes run on 171 blocks served by a fleet of 164 buses of various lengths and configurations. During the school year there are additional blocks that operate service (school trippers); however, these additional blocks are typically short.

Fuel

STA's current fuel use was collected and used to estimate energy costs throughout the study life. Cost escalation was not assumed throughout the study. When vehicles are added to the fleet, all vehicles of the same length that are acquired in that year to replace retiring vehicles are assumed to operate the average annual mileage of that vehicle size and, for diesels, are assumed to consume the same amount of fuel as other vehicles of the same length and fuel type. According to STA, the average heavy-duty bus operates between 50,000 and 55,000 miles per year. Historical fuel economy information for the fleet are included in **Table 2**.

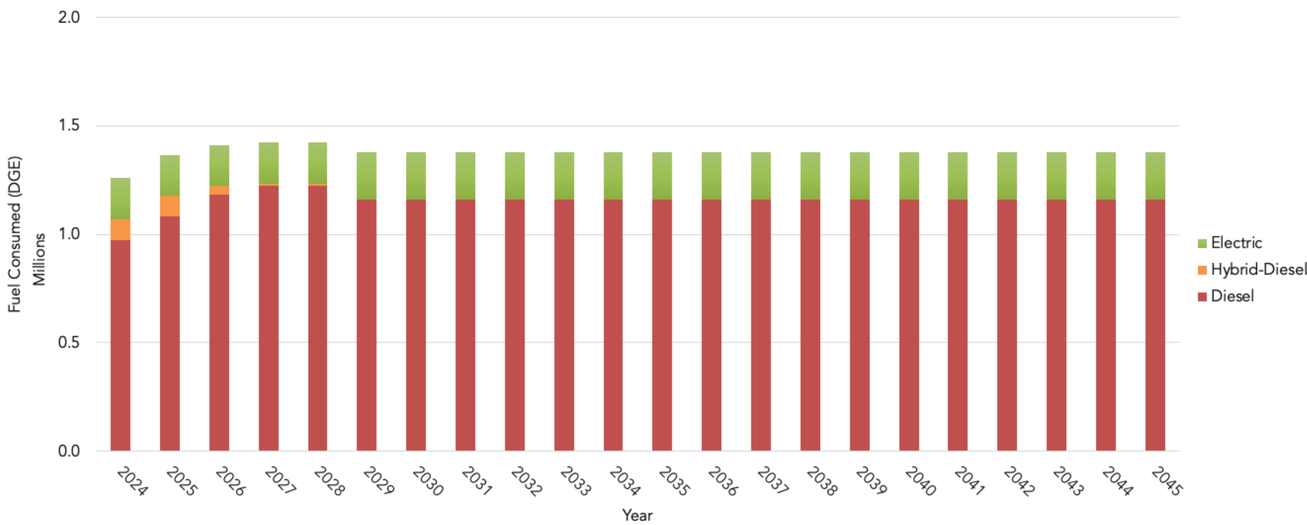
Table 2: Fuel Economy by Bus Length and Fuel Type

Vehicle Length	Diesel (mpg)	Diesel-Hybrid (mpg)	BEB (kwh/mi)
40’	5.7	6.3	—
60’	3.3	—	—

mpg = miles per gallon
mpgdge = miles per gallon diesel gallon
kWh/mi = kilowatt-hour per mile

Annual fuel use by fuel type was calculated to form the baseline scenario. During the transition period (2024-2045), cost of using diesel fuel (for diesel and hybrid-diesel vehicles) was estimated to be approximately $25 million and the cost of electricity was estimated to be $5 million. **Figure 4** below shows the estimated annual fuel use by fuel type across the transition period, based on STA's currently planned procurement schedule.

Figure 4: Annual Fuel Use by Fuel Type (DGE)



Maintenance

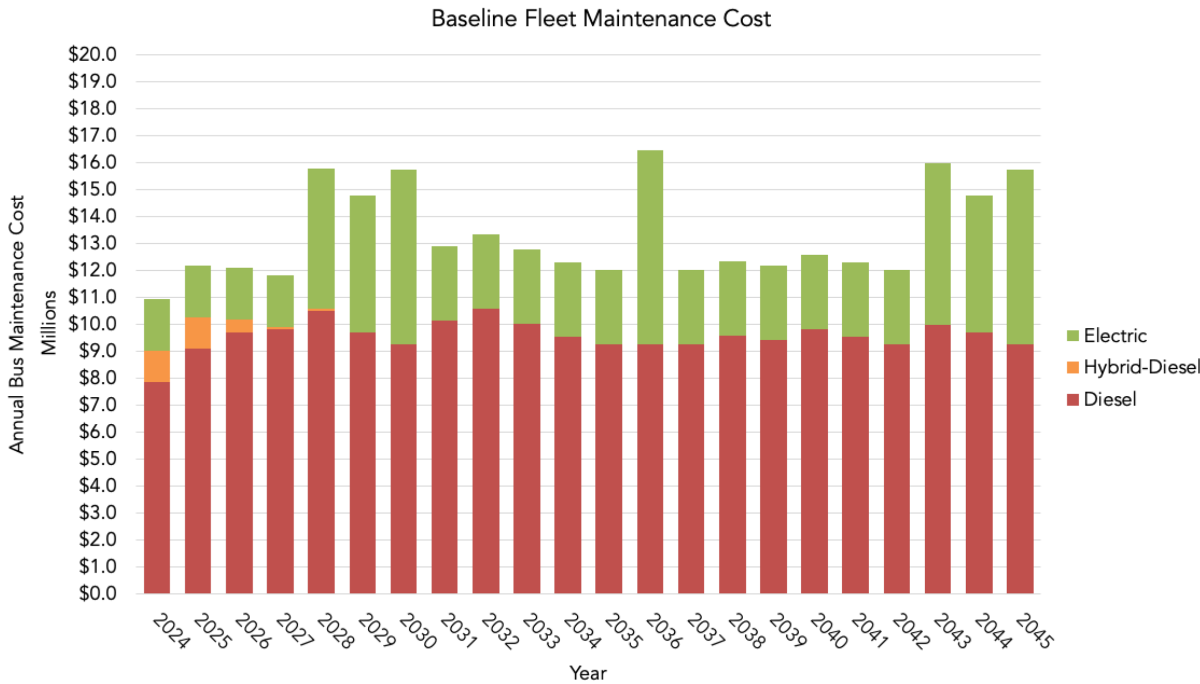
Historical maintenance costs are used to project future maintenance costs for all legacy fuel types. The average maintenance cost per mile for the fleet of $1.43/mile was provided by STA. It should be noted that the average maintenance costs per mile are affected by the age of the vehicle or fleet, as older fleets typically experience higher maintenance costs per mile. The average midlife overhaul cost for the current diesel vehicles was determined to be approximately $43,000 ($29,000 for an engine rebuild and $14,000 for a transmission rebuild).

In the updated 2023 assessment, the total fleet maintenance cost throughout the transition period were estimated at $293 million with an average annual cost of approximately $13 million. It should be noted that these costs are considerably higher than the original analysis due to better visibility by STA of the actual per mile maintenance costs for the fleet. **Table 3** below shows the annual fleet maintenance cost by fuel type and **Figure 5** shows the baseline fleet maintenance cost across the transition period.

Table 3: Annual Fleet Maintenance Cost (Baseline)

Fuel Type	2024-2045 Total	Average Annual
Diesel	$211M	$10M
Hybrid-Diesel	$3M	$134K
Battery Electric	$80M	$4M

Figure 5: Baseline Fleet Maintenance Cost



Section 6 - Service Assessment

Bus efficiency and range are primarily driven by vehicle specifications; however, it 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, etc.), topography (i.e., grades), climate (i.e., 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. Therefore, it is critical to determine efficiency and range estimates that are based on an accurate representation of the operating conditions associated with STA's system to complete the assessment.

The first task in the Service Assessment was to develop route and bus models to run operating simulations for representative STA routes. CTE uses Autonomie, a powertrain simulation software program developed by Argonne National Labs for the heavy-duty trucking and automotive industry. CTE has modified software parameters specifically for electric buses to assess energy efficiencies, energy consumption, and range projections. CTE collected GPS data from seventeen (17) STA routes, including the proposed CCL and MRL routes. GPS data includes time, distance, vehicle speed, vehicle acceleration, GPS coordinates, and roadway grade that is used to develop the route model. CTE used component level specifications and the collected route data to develop a baseline performance model by simulating the operation of an electric bus on each route. The route modeling included analysis of several scenarios, varying passenger load, accessory load, and battery degradation, to estimate real-world vehicle performance, fuel efficiency, and range.

Ideally it would be best to collect data and model every route in STA's network; however, this is impractical due to the amount of time and labor this approach would require. Instead, a sampling approach is used where sample routes are identified with respect to topography and operating profile (e.g. average speeds, etc.). The modeling results of the sample routes are then applied to the routes and blocks that share the same characteristics.

The data from the routes, as well as the specifications for each of the bus types selected, was used to simulate operation of each type of bus on each type of route. The models were run with varying loads to represent "nominal" and "strenuous" loading conditions. Nominal loading conditions assume average passenger loads and moderate temperature over the course of the day, which places marginal demands on the motor and heating, ventilation, and air conditions (HVAC) system. Strenuous loading conditions assume high or maximum passenger loading and either very low or very high temperature (based on agency's latitude) that requires near maximum output of the HVAC system. This Nominal/Strenuous approach offers a range of operating efficiencies to use in estimating average annual energy use (Nominal) or planning minimum service demands (Strenuous). Details for the modeled operating scenarios are included in **Table 4** below.

Table 4: Modeling Operating Scenarios

Vehicle Length	Condition	Occupants	Average HVAC Load	Average Other Accessory Load	Total Average Accessory Load
35’	Nominal	17 + Operator	3.8 kW	2 kW	5.8 kW
35’	Strenuous	28 + Operator	10.45 kW	2 kW	12.45 kW
35’ Low Occupancy	Nominal	9 + Operator	3.8 kW	2 kW	5.8 kW
35’ Low Occupancy	Strenuous	16 + Operator	10.45 kW	2 kW	12.45 kW
40’	Nominal	18 + Operator	4 kW	2 kW	6 kW
40’	Strenuous	30 + Operator	11 kW	2 kW	13 kW
40’ Low Occupancy	Nominal	9 + Operator	4 kW	2 kW	6 kW
40’ Low Occupancy	Strenuous	18 + Operator	11 kW	2 kW	13 kW
60’	Nominal	19 + Operator	7.2 kW	3 kW	10.2 kW
60’	Strenuous	34 + Operator	19.8 kW	3 kW	22.8 kW

Estimated efficiencies developed based on modeling are provided in **Table 5**, **6**, and **7**.

Table 5**: **Modeling Results Summary for 35-foot BEBs

Route	Profile	Length (mi)	Duration (h:mm)	Efficiency (kWh/mi)	
				Nominal	Strenuous
21	Flat, Slow	5.8	0:36	1.7	2.5
24	Hills, Slow	9.5	0:58	2.4	3.2
39	Flat, Slow	10.5	0:57	2.0	2.7
64	Hills, Fast	39.4	1:56	2.0	2.4
90	Flat, Slow	15.5	1:16	1.8	2.4
97	Hills, Slow	19.2	2:01	1.8	2.2
98	Flat, Slow	19.3	1:14	1.8	2.3
			Average	***1.9***	***2.5***

Table 6*: *Modeling Results Summary for 40-foot BEBs

Route	Profile	Length (mi)	Duration (h:mm)	Efficiency (kWh/mi)	
				Nominal	Strenuous
20	Hills, Slow	8.0	0:24	1.6	2.1
21	Flat, Slow	5.8	0:36	1.7	2.5
24	Hills, Slow	9.5	0:58	2.3	3.2
25	Hills, Slow	17.9	1:31	2.2	2.9
33	Hills, Slow	16.9	0:54	1.8	2.6
34	Hills, Slow	11.9	0:57	2.0	2.7
39	Flat, Slow	10.5	0:57	2.0	2.8
44	Hills, Slow	8.3	0:37	1.9	2.6
45	Hills, Slow	13.9	1:11	2.1	2.8
64	Hills, Fast	39.4	1:56	2.1	2.5
66	Hills, Fast	33.0	1:04	2.1	2.4
74	Flat, Fast	35.4	1:19	2.2	2.6
90	Flat, Slow	15.5	1:16	1.8	2.5
97	Hills, Slow	19.2	2:01	1.8	2.2
98	Flat, Slow	19.3	1:14	1.8	2.3
			Average	***2.0***	***2.6***

Table 7: Modeling Results Summary for 60-foot BEBs

Route	Profile	Length (mi)	Duration (h:mm)	Efficiency (kWh/mi)	
				Nominal	Strenuous
25	Hills, Slow	17.9	1:31	3.4	4.6
64	Hills, Fast	39.4	1:56	3.1	3.8
66	Hills, Fast	33.0	1:04	3.0	3.5
74	Flat, Fast	35.4	1:19	3.1	3.6
			Average	***3.1***	***3.9***

Using vehicle performance predicted from route modeling and simulation completed in 2020 as well as recent data collected during BEB operations in STA service, CTE analyzed the expected performance and range needed on every block in STA's network (Summer 2023). The block analysis was completed based on the weekday blocks. The analysis focuses on bus endurance and range limitations to determine if the ZEBs could meet the service requirements of the blocks throughout the transition period. The energy needed to complete a block is compared to the available energy for the respective bus type that is planned for the block to determine if a BEB or FCEB can successfully operate on that block. Data from the limited current BEB operations was also compared to the results to validate these route modeling projections.

Research suggests that battery density for electric vehicles has improved by an average of 5% each year.[1] For the purposes of this study, considering the extended period of a complete fleet transition (e.g., through 2045), CTE assumes a more conservative 5% improvement every two years. If the trend continues, it is expected that buses may continue to improve their ability to carry more energy without a weight penalty or reduction in passenger capacity. Over time, BEBs are expected to approach the capability to replace all of an agency's fossil-fuel buses one-for-one. For FCEBs, improvements in hydrogen compression and storage technologies are expected to occur over the course of the transition period; however, based on recent advancements an achievable distance of 350 miles was used for feasibility evaluation.

The block analysis, with the assumption of 5% improvement in battery capacity every other year, is used to determine the timeline for when routes and blocks become achievable for BEBs to replace diesel buses 1:1. For FCEBs, block feasibility is compared to the current estimated range. This information is used to then inform ZEB procurements in the Fleet Assessment.

The results from the block analysis are used to determine when/if a full transition to BEBs or FCEBs may be feasible. 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.

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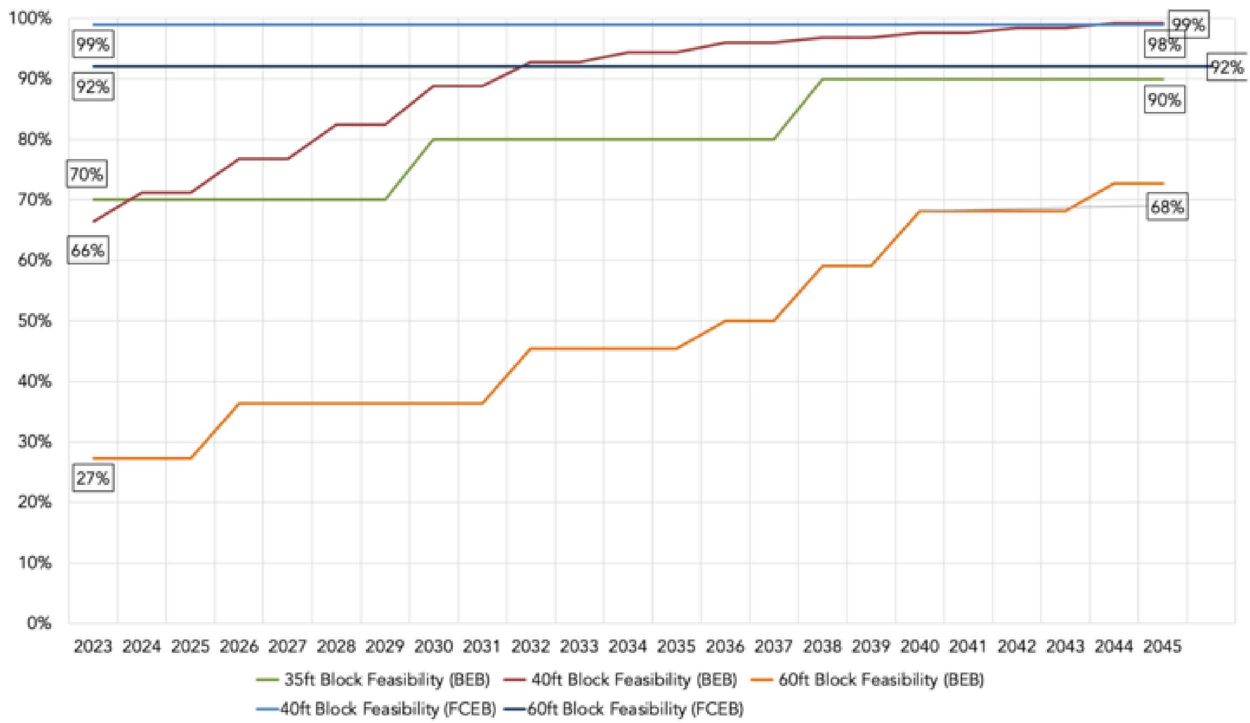
[1]U.S. Department of Energy; LONG-RANGE, LOW-COST ELECTRIC VEHICLES ENABLED BY ROBUST ENERGY STORAGE, MRS Energy & Sustainability, Volume 2, Wednesday, September 9, 2015; https://arpa-e.energy.gov/?q=publications/long-range-low-cost-electric-vehicles-enabled-robust-energy-storage

Results from the updated block analysis that indicate the yearly block achievability by bus length throughout the transition period for BEBs and FCEBs are included on **Figure 6**.

Figure 6*: *Overall BEB and FCEB Block Achievability by Bus Length



As detailed in **Figure 6**, the block evaluation indicates estimated feasibility as follows:

Table 8: Estimated Block Feasibility for BEBs

Vehicle Length	2023	2045
35’	70%	90%
40’	66%	98%
60’	27%	68%

The vast majority of blocks operated by 35’ and 40’ buses are expected to be feasible to operate with a BEB under all conditions by 2045; however, approximately 32% of the 60’ blocks still remain infeasible. Note that as these are projections, there may be limitations to the actual battery capacity available on BEBs in the future due to weight restrictions, particularly on the 60’ BEBs. The block achievability evaluation includes CCL and MRL blocks that include on-route charging and are determined to be feasible. These CCL and MRL routes are achievable upon deployment based on the modeling completed as part of the detailed evaluations of each route and included in the previously mentioned Implementation Plans.

While routes and block schedules are unlikely to remain the same over the course of the transition period, this projection assumes the blocks will retain a similar structure to what is in place today. Despite changes over time, this analysis assumes blocks will maintain a similar distribution of distance, relative speeds, and elevation changes by covering similar locations within the city and using similar roads to get to these destinations. This core assumption affects energy use estimates as well as block achievability in each year.

As part of the updated Service Assessment, CTE reviewed the battery capacity of the BEBs that STA already has in their fleet or has contracted to have in their fleet by the end of 2023 to assess feasibility for the service as it exists today. **Table 9** below shows the results based on the characteristics (battery capacity and bus size) of the current STA fleet (2023).

Table 9: Block Feasibility for Current STA Fleet Vehicles

Bus Size (ft)	Number of Vehicles	Nameplate Battery Capacity (kWh)	Usable Battery Capacity (kWh)	Strenuous Blocks Achievable BOL Battery (%)	Strenuous Blocks Achievable EOL Battery (%)
35	3	440	396	70%	60%
40	2	320	288	On-Route Charge	On-Route Charge
40	8	440	396	54%	37%
40	3	520	468	66%	38%
40	10	675	608	87%	62%
60	10	320	288	On-Route Charge	On-Route Charge
60	4	520	468	27%	0%

Please note that 29-foot and 35-foot buses are not included in the block achievability chart for FCEBs because there are currently no commercially available FCEBs of that size vehicle on the market today and it is unclear if one will ever be built. In addition, based on the May 2023 Fleet Plan, it is expected that these vehicles will be replaced with 40’ buses in the future. A review of the data indicates that 99% of the blocks operated by 40’ buses and 92% of the blocks operated by 60’ buses are feasible with a FCEB today and in the future.

Section 7 - Fleet Assessment

The goal of the Fleet Assessment is to determine the type and quantity of ZEBs, as well as the schedule and cost to transition a transit fleet to zero emission. Results from the Service Assessment are integrated with the STA's current fleet replacement plan and purchase schedule (May 2023) to produce the projected bus replacement timeline and the associated total capital cost.

Cost Assumptions

CTE and STA created cost assumptions for this analysis for each bus length and technology type (e.g., diesel, BEB, FCEB). Key assumptions for the bus cost estimate are as follows:

- All procurements based on 15-year service life
- Total fleet size is based on STA's May 2023 procurement schedule
- 5% improvement in battery technology every two years
- Usable capacity estimated at 90% of nameplate capacity. End of Life (warranty) estimated at 80% of usable capacity
- ICE and ZEB bus costs are based on Washington State Procurement Contract (2023 updated costs)
- 3% annual inflation

Conventional wisdom dictates that the costs of BEBs will decrease over time due to higher production volume and competition from new vendors entering the market. While initially this was true, costs appear to have leveled out in recent years. However, it should be also noted that vendors have added more battery storage over the same time period without increasing base costs. FCEB prices are expected to decrease over time as vehicle orders increase; however, CTE does not currently have an adequate basis to reduce the costs over time for the purchase of FCEBs.

Table 10 provides cost estimates for new vehicle purchases used in the analysis. All bus purchase prices are inclusive of tax and configurable options and are based on the current Washington State Purchasing Contract. The configurable options cost added to all base bus is $60,000.

Table 10*: *Cost Estimates Used in Fleet Assessment (2023)

Length	BEB Base Price Average	FCEB Base Price Average	Diesel Base Price Average	Hybrid Base Price Average
35'	$1,064,072	-	$540,000	-
40'	$1,074,432	$1,306,165	$546,000	-
60'	$1,574,688	$1,928,192	$861,000	$682,000
Double Decker	$1,484,097	-	$1,043,097	-

ZEB Fleet Transition Schedule and Composition

Given the block analysis and STA's fleet replacement schedule and currently planned procurements, a transition timeline depicts the annual baseline fleet composition through the transition period. The baseline scenario utilizes existing planned procurements of ZEBs (40 ZEBs by the end of 2023). All other replacements moving forward assumed to be diesel for comparison except for planned BEB BRT service and three additional vehicles in 2029. According to STA's current procurement plan, STA's fleet is expected to grow to 187 vehicles. The baseline scenario is used for comparison to the other scenarios in the evaluation. The annual fleet composition is depicted in **Figure 7**.

Figure 7*: *Baseline - Annual Fleet Composition

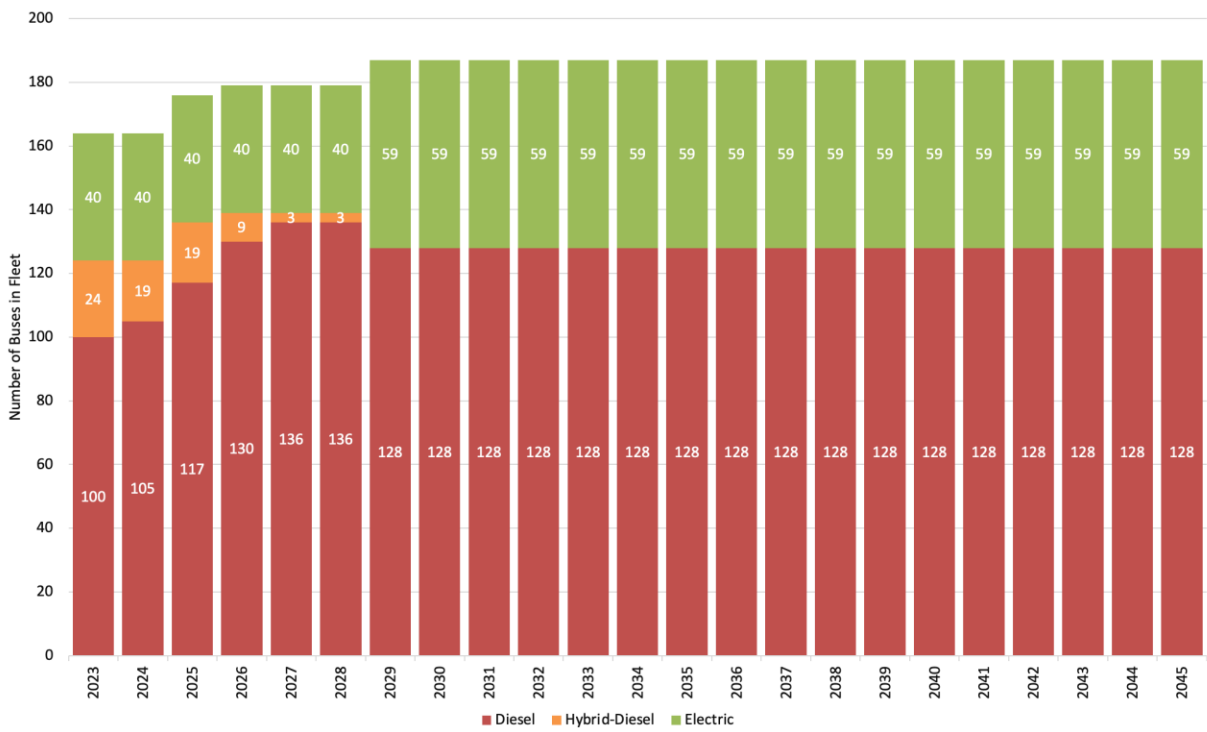
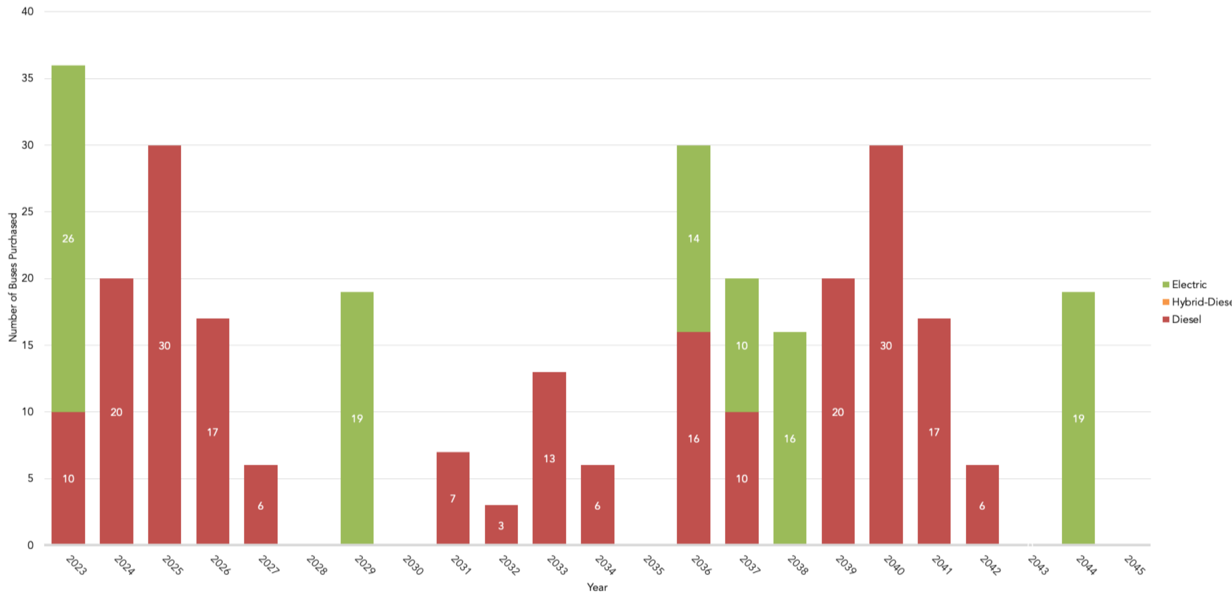


Figure 8 depicts annual fleet purchases by fuel type. The current plan provides for a conversion to 32% ZEB by the end of the transition period. This plan is estimated to cost $358 million in expenditures between 2024 and 2045 with an average annual expense of $16 million.

Figure 8: Baseline - Annual Fleet Purchases



Despite recent increases in energy storage, BEBs are still subject to range limitations and cannot be placed into service on every block on a 1:1 replacement basis for diesel. As discussed in the Service Assessment section, BEBs can currently be operated on between 27% and 70% of STA's blocks depending on vehicle size, improving to between 68% and 98% by the end of the transition period. It should be noted that this analysis includes use of on-route charging for the planned CCL, MRL, and future BRT blocks. If STA desires to place BEBs on routes where the estimated vehicle range is less than the block distance, they must (1) modify the block distance and duration; (2) use multiple BEBs to replace a single diesel vehicle; or (3) utilize on-route charging. As there is no regulatory driver for full-scale BEB replacement, CTE assumes that STA would replace the vehicles that could be replaced with BEBs on a 1:1 basis, including those supporting the CCL and MRL where on-route charging is anticipated.

A mixed fleet scenario of both BEBs and ICE vehicles (based on block feasibility) is depicted in **Figure 9**. In this scenario, BEBs are charged at the depot only without use of on-route charging (except for the current on-route service as well as the 2029 planned BRT). Of the 187 vehicles, 178 would be BEB and nine remaining diesel by the end of the transition period in 2045 (a 95% ZEB fleet).

***Figure 9**: BEB Depot Only - Fleet Composition Projection (Scenario 1)*

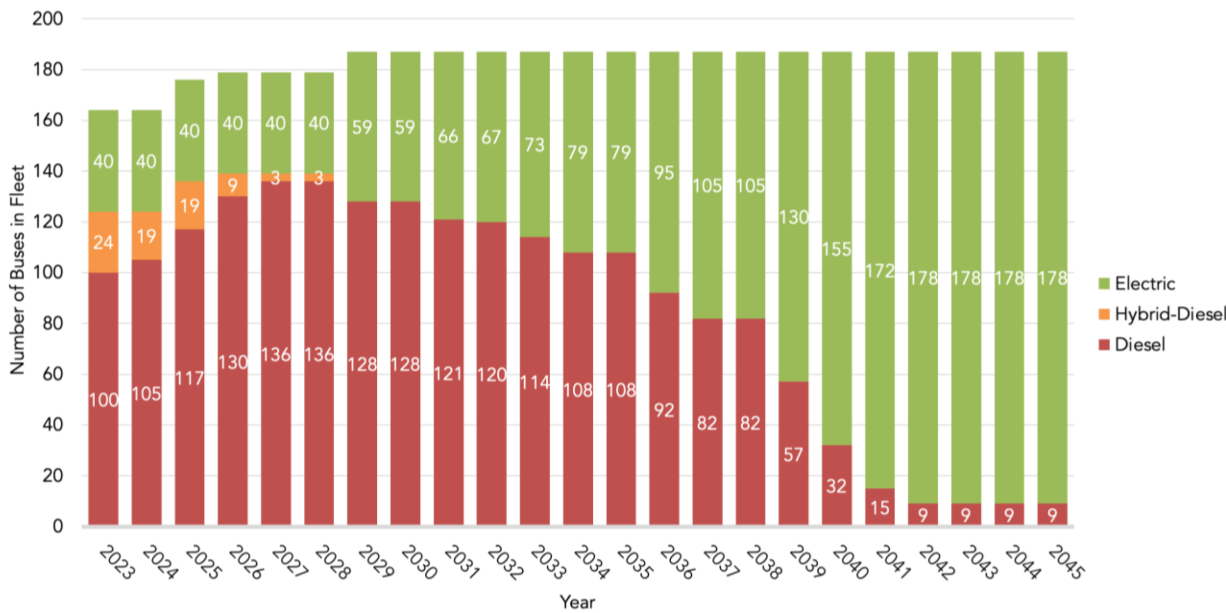
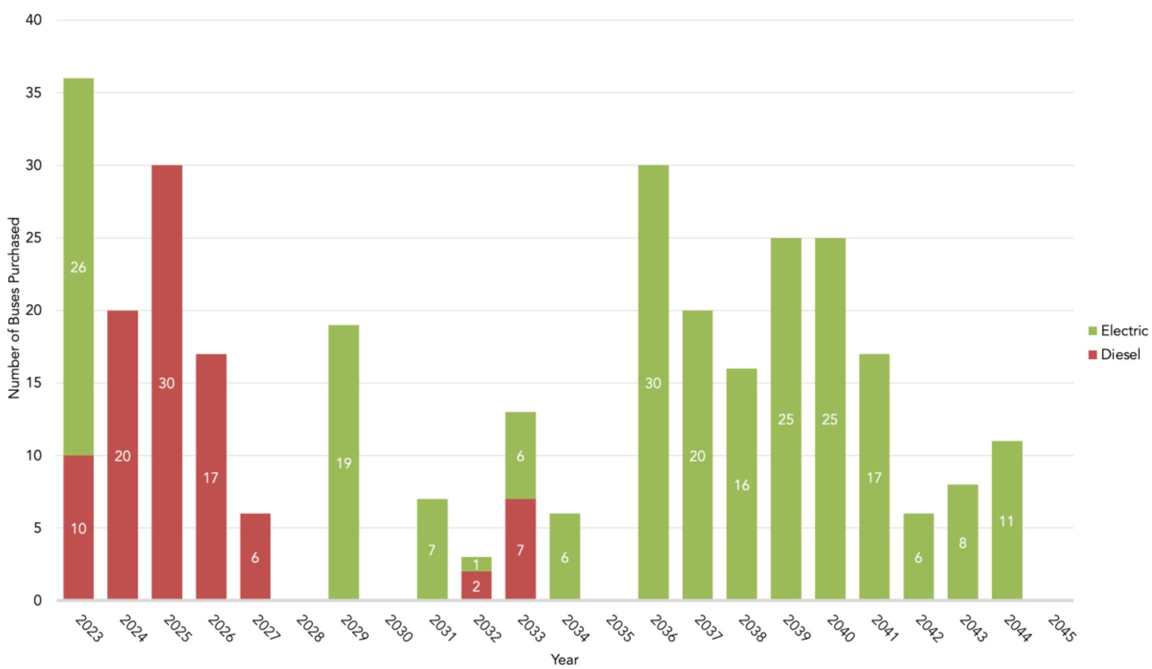


Figure 10 shows the annual fleet purchases by fuel type under Scenario 1. Under this scenario costs are expected to reach $464 million total with an average annual expense of $21 million.

Figure 10: BEB Depot Only – Annual Fleet Purchases (Scenario 1)



The second fleet transition scenario, depicted below in **Figure 11**, is a mixed fleet of BEBs and FCEBs where BEBs are charged at the depot. In this scenario, STA's fleet is composed of 130 BEBs and 57 FCEBs (70% BEB/30% FCEB), reaching 100% ZEB fleet by 2045.

Figure 11: BEB Depot and FCEB – Fleet Composition Projection (Scenario 2)

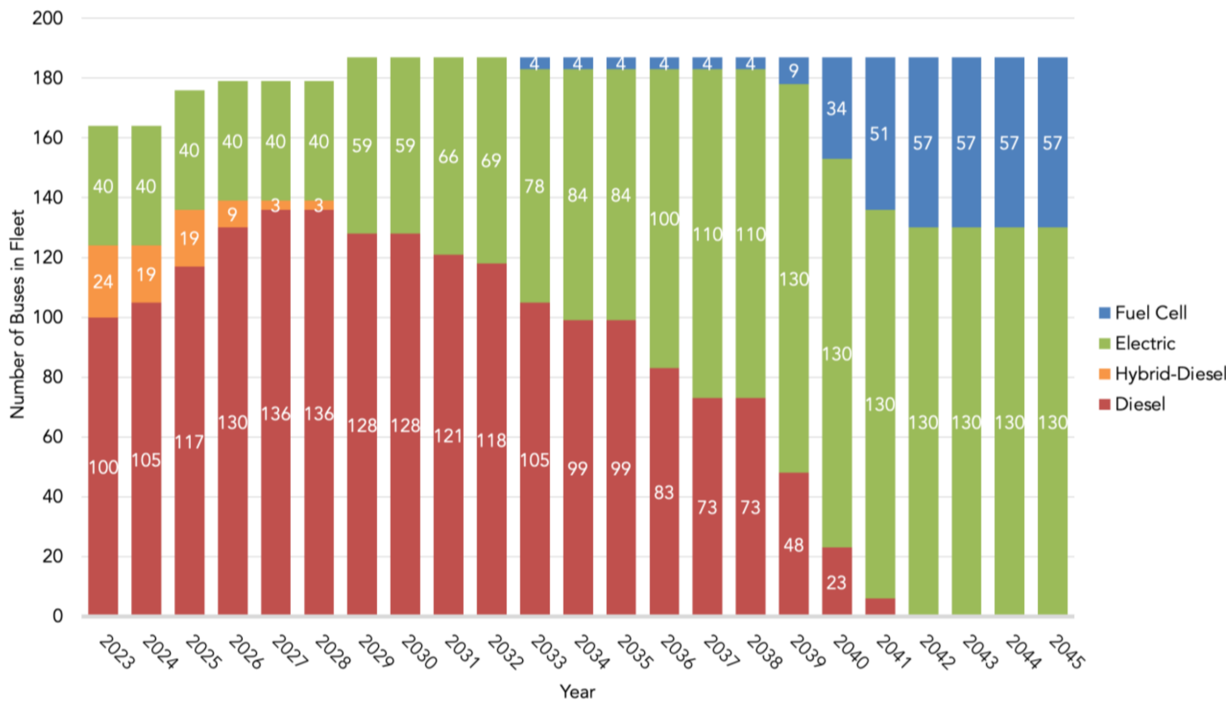
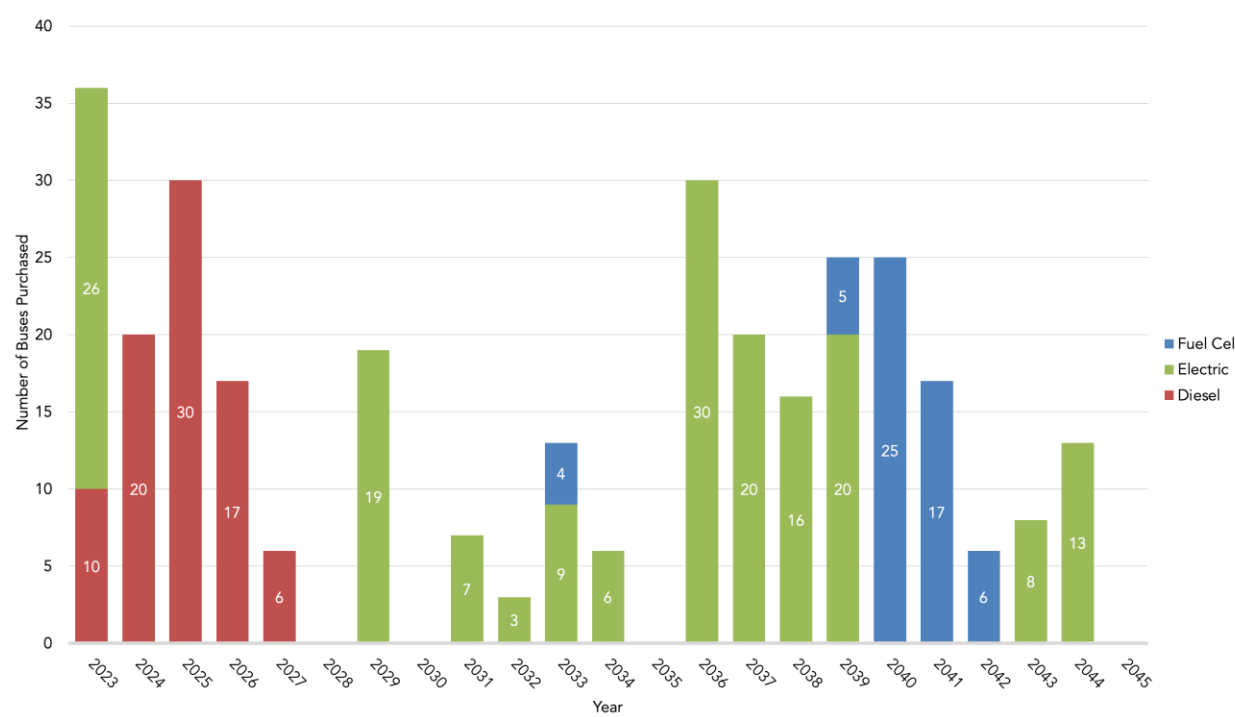


Figure 12 depicts the annual fleet purchases by fuel type in this scenario. Expenditures for this scenario were estimated to be $492 million with an average annual expense of $22 million.

Figure 12: BEB Depot and FCEB – Annual Fleet Purchases (Scenario 2)



The third fleet transition scenario, depicted in **Figure 13**, is one in which all BEBs in the original Baseline scenario will remain BEB with all others replaced with FCEBs. In this scenario, STA reaches 100% ZEB by 2045 with 128 FCEBs and 59 BEBs (68% FCEB/32% BEB).

Figure 13: FCEB Replacements Only – Fleet Composition Projection (Scenario 3)

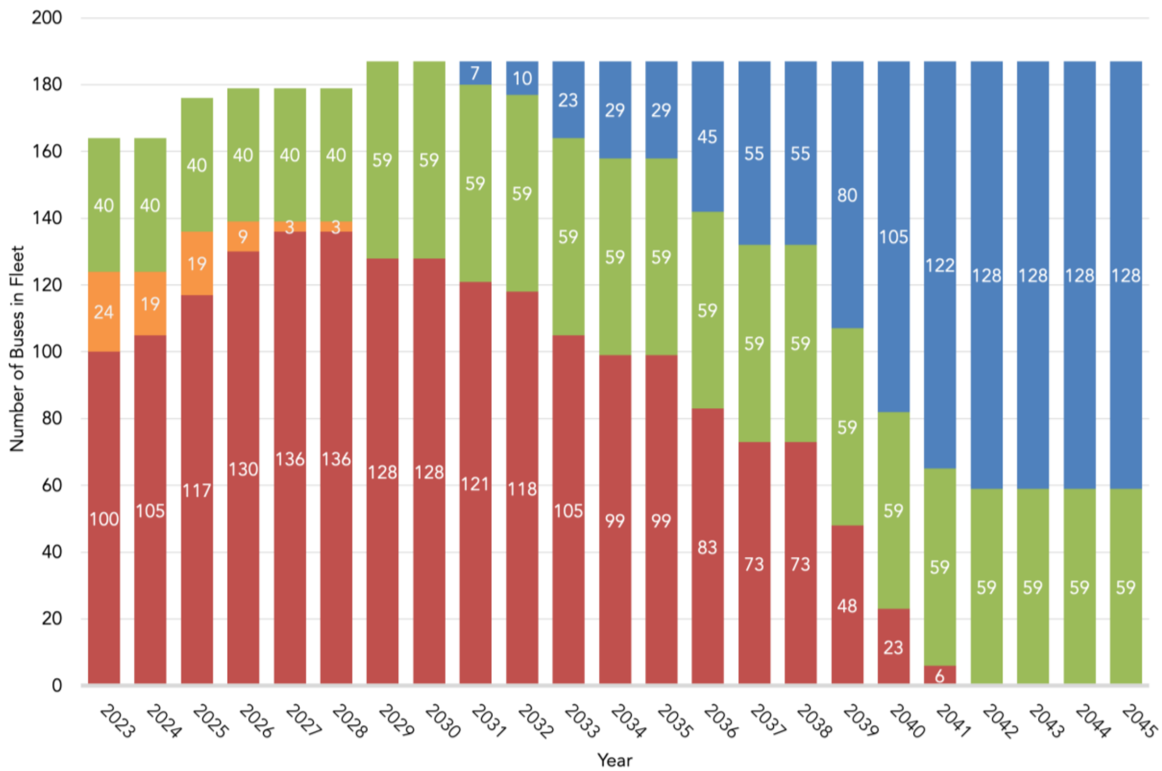
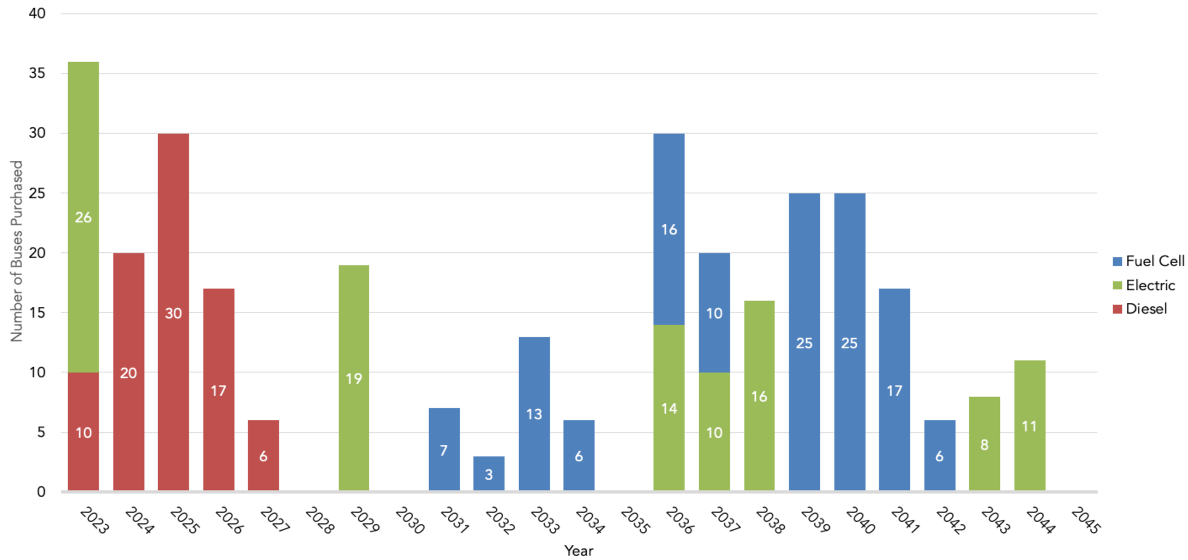


Figure 14 shows the annual fleet purchases by fuel type under Scenario 3. Total expenditures under this scenario are expected to be $526 million with an average annual expense of $24 million.

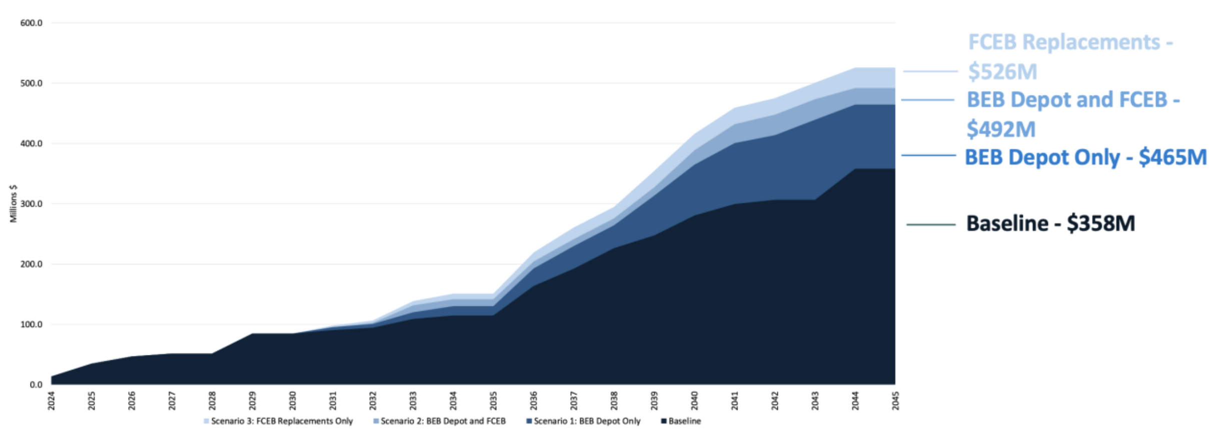
Figure 14: FCEB Replacements Only – Annual Fleet Purchases (Scenario 3)



BEB Fleet Transition Costs

The transition and fleet composition schedules were used to develop the total capital cost for vehicle purchases throughout the transition period. Results are provided in **Figure 15** below. Note that the costs are provided in 2023 dollars, assuming 3% annual inflation of the cost of vehicles during the transition period. The cumulative costs depicted in the figure include all buses that are projected to be purchased during the scenario timeline (2024-2045).

Figure 15: Cumulative Vehicle Purchase Costs



By the end of the transition period, the cumulative vehicle costs vary substantially according to the technology selected, as does the percentage of the fleet that can be transitioned to zero emission by 2045. Due to ICE-vehicle purchases in STA's purchase plan from 2026 through 2029, none of the scenarios can achieve 100% ZEB by 2040. However, Scenarios 2 and 3 can be expected to achieve 100% ZEB by 2045, while Scenario 1 achieves 95% ZEB by 2045.

Table 11: Capital Cost Summary for Vehicle Purchases (2024 – 2045)

	Baseline	BEB Depot Only (Scenario 1)	Mixed Fleet BEB & FCEB (Scenario 2)	FCEB Replacements Only (Scenario 3)
Cost	$358. M	$464.5 M	$491.6 M	$525.6 M
Incremental Cost Over Baseline	-	$106.5 M	$133.6 M	$167.6 M
Incremental Cost (%)	-	30%	37%	47%
% ZEB by 2045	32%	95%	100%	100%

Section 8 - Maintenance Assessment

The objective of the updated Maintenance Assessment is to estimate maintenance costs associated with each fleet transition scenario.

One of the expected benefits of moving to a BEB or FCEB fleet is a reduction in maintenance costs. Conventional wisdom estimates that a transit agency may attain maintenance savings up to 30% by operating BEBs. This is due to the fact that there are fewer fluids to replace (no engine oil or transmission fluid), fewer brake changes due to regenerative braking, and far fewer moving parts than on a diesel bus. However, the savings in traditional maintenance costs may be offset by the cost of battery or fuel-cell replacements over the life of the vehicle. For this analysis, a battery warranty included with the vehicle purchase cost was assumed to mitigate the mid-life battery replacement.

There is limited data available on early deployments and many early deployments are from new manufacturers where production quality issues manifest as maintenance issues. Thus, assumptions used for calculating cost for labor and materials is based on current STA maintenance costs. BEB and FCEB labor and material costs are based on a percentage of costs associated with maintaining diesel buses or comparative analysis to maintenance of compressed natural gas (CNG) buses.

Percentages were derived from an analysis performed by the U.S. Department of Energy National Renewable Energy Laboratory (U.S. DOE NREL). There is limited information available regarding maintenance costs for FCEBs due to the limited number of vehicles in operation in the United States. Comparative data for FCEB operations was obtained from recent operations of 40’ FCEBs at Orange County Transit Authority (OCTA). In addition to labor and materials, the cost impact of mid-life overhauls for major components for each type of bus is also estimated. Maintenance cost assumptions are provided in **Tables 12** and **13**. Note that the cost per mile basis for the 2023 analysis is substantially higher than the cost per mile used for diesel and diesel hybrid operations in the 2020 analysis as a result of better visibility for STA on the operational costs.

Table 12: Maintenance Cost Assumptions

Type	Labor & Materials Estimate	Source
Diesel	$1.43/mile (35’, 40’, 60’)	STA Data
Diesel Hybrid	$1.43/mile (35’, 40’)	STA Data
BEB	$1.00/mile (35’, 40’, 60’)	Based on 30% reduction of diesel maintenance cost
FCEB	$1.07/mile (35’, 40’ , 60’)	Based on 25% reduction of diesel maintenance cost based on OCTA data

Table 13: Mid Life Overhaul Cost Estimates

Type	Overhaul Scope	Estimate	Source
Diesel	Engine & transmission overhaul	$29,0000 Engine, $14,000 Transmission = $43,000	STA Estimate
Diesel Hybrid	Hybrid system rebuild	$70,000 hybrid system rebuild	STA Estimate
BEB	Battery replacement [Can be mitigated with purchase of battery warranty during procurement for ~$35 – 100K]	$232,500 Battery Replacement	OEM Estimate
FCEB	Fuel cell overhaul	$40k per bus	OEM Estimate

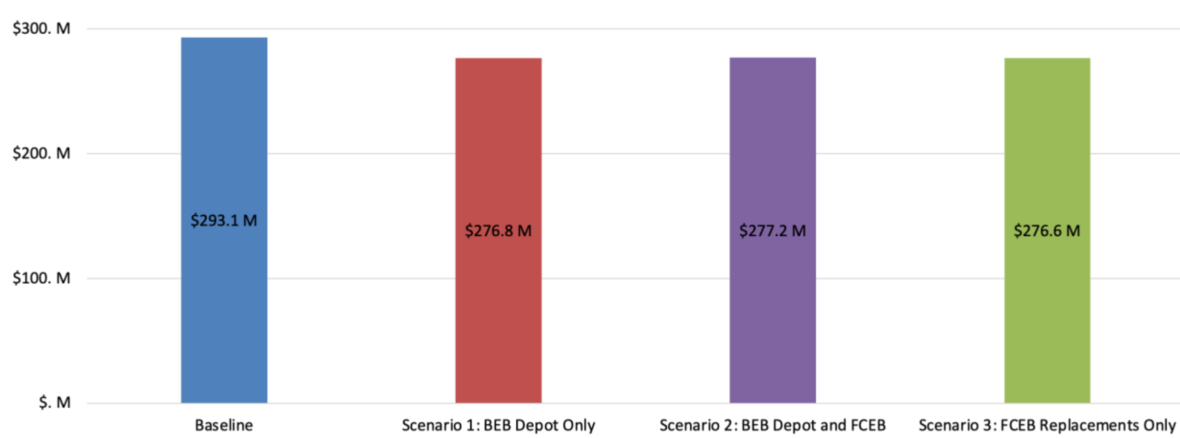
The cumulative estimated costs of maintenance for each scenario over the transition period are provided in **Figure 16.** The total cost associated with the baseline scenario across the transition period is $293 million with a $13 million average annual cost. In the Baseline scenario, diesel vehicles would account for $211 million of that total cost, diesel hybrid would account for $3 million, and electric $80 million.

The total cost associated with the BEB Depot Only across the transition period is $277 million, with diesel fuel type vehicles accounting for $139 million, diesel hybrid fuel type accounting for $3 million, and battery electric vehicles contributing to $139 million of the total cost.

Maintenance costs for the BEB Depot and FCEB scenario was estimated at a total of $277 million across the transition timeline with diesel vehicles accounting for $129 million of the total, diesel hybrid $3 million, electric $126 million, and fuel cell vehicles $19 million.

Lastly, the total cost across the transition period for the FCEB Replacements Only scenario was estimated to be $277 million with the following breakdown: diesel $140 million, diesel hybrid $3 million, electric $77 million, and fuel cell vehicles $57 million.

Figure 16: Maintenance Evaluation Cost Summary



Section 9 – Charging Analysis

A charging analysis was completed to determine the feasibility of charging all of the BEBs that STA has planned for deployment by the end of 2023 at the Boone Northwest Garage with the available charging infrastructure. The charging evaluation was also used to support the development of the costs for the Fuel Assessment in the following section.

The Northwest Boone Garage is currently has five (5) 150 kW ABB chargers, each equipped with two plug-in dispensers for sequential charging, as well as two (2) 450 kW ABB high capacity overhead chargers with drop down pantographs. STA currently has plans to install five (5) additional 150 kW ABB plug in chargers equipped with two (2) dispensers each in the garage as well. The Spokane Community College (SCC) Transit Center (City Line) and Moran Station Park and Ride (Monroe-Regal) are each equipped with two (2) 450 kW ABB high capacity overhead chargers with drop down pantographs for on-route charging of BEBs.

City Line Service

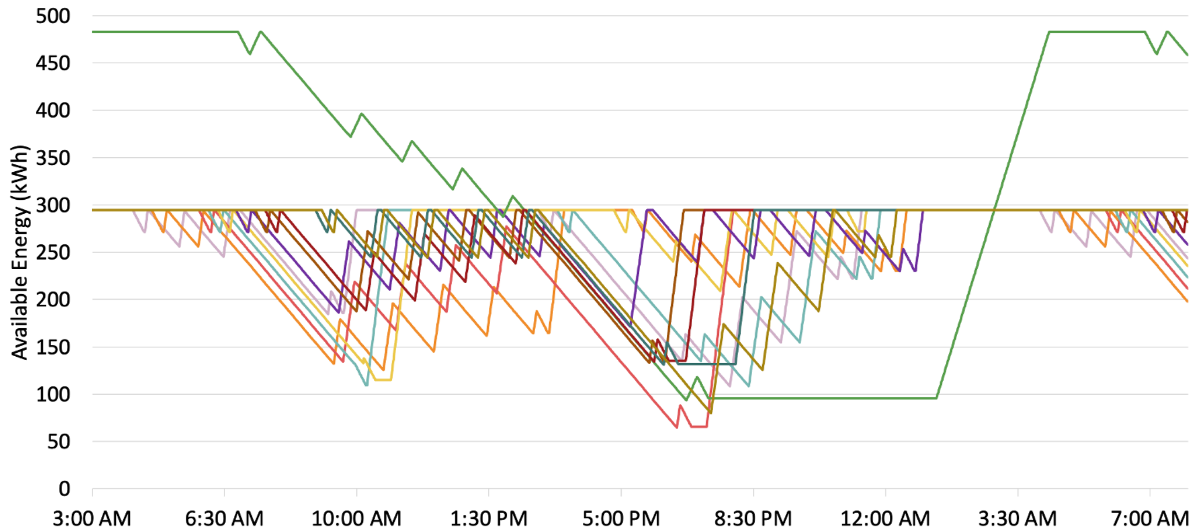
The City Line BRT is scheduled to begin service in July 2023 utilizing ten (10) 60' New Flyer BEBs equipped with fast charge 320 kWh batteries and one (1) 60' New Flyer BEB equipped with a 520 kWh long-range battery. Vehicles are stored at the Northwest Boone Garage and charge on-route at the SCC Transit Center. Overnight or top off charging may occur at the Northwest Boone Garage either before deployment or after the vehicle returns from performing service. For this analysis, it was assumed at the charging at the depot only utilizes the high capacity charger. The service will follow the requirements established in **Table 14** in 2024 following a ramp up period in 2023.

Table 14: City Line Service Requirements

	Early Morning 4:30A-6:00A	Morning 6:00A-7:00A	AM Peak 7:00A-9:00A	Midday 9:00A-3:00P	PM Peak 3:00P-6:00P	Evening 6:00P-11:00P	Late Night 11:00P-Close
Cycle Time	60	90	67.5	80	67.5	90	60
Headway	30	15	7.5	10	7.5	15	30
Bus Requirement	2	6	9	8	9	6	2

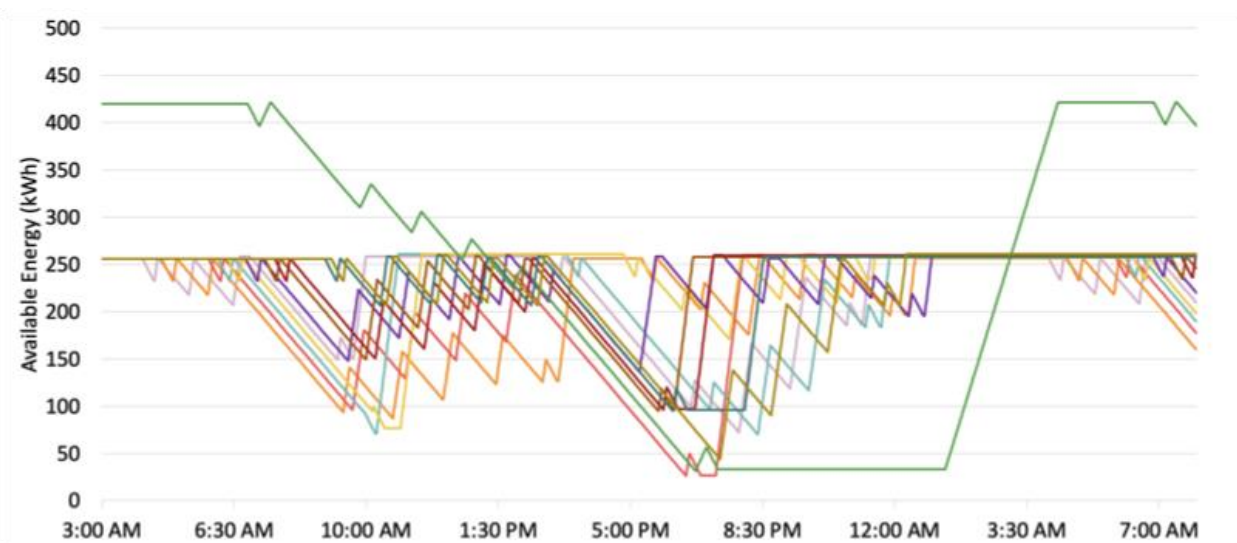
Example blocks were developed to fit the schedule requirements for analysis. Multiple scenarios were evaluated to determine feasibility of completing the service under strenuous conditions. In the first scenario, shown in **Figure 17**, BEBs initially leave the garage with a full battery and charge each time through the SCC Transit Center for the maximum available layover (minus docking time) up to a total of 25 minutes.

Figure 17: City Line Charging – Scenario 1



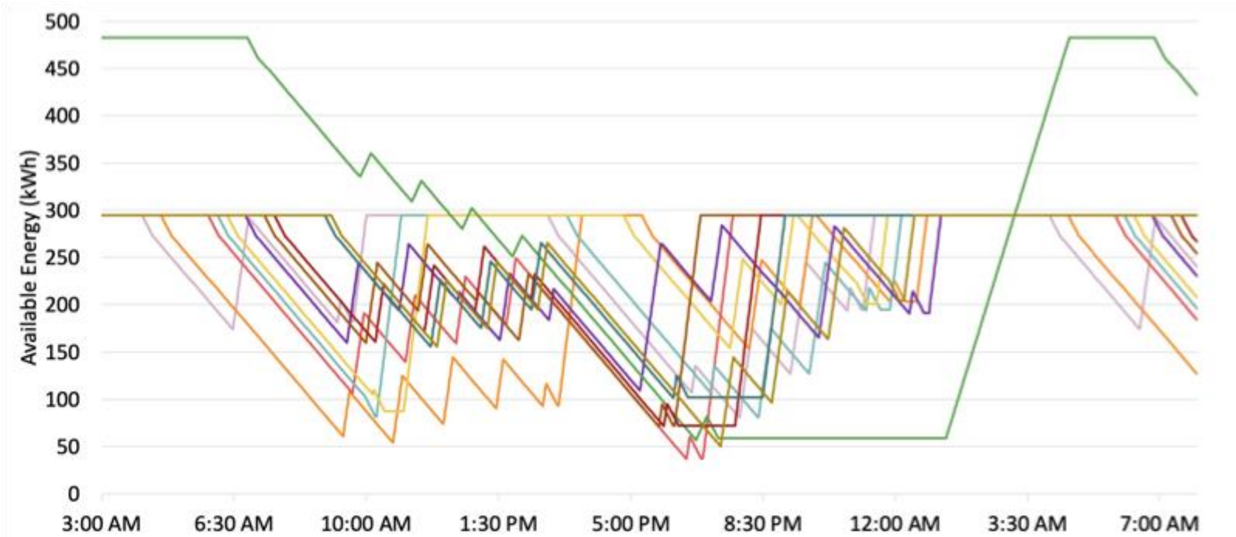
In the second scenario, shown in **Figure 18**, BEBs initially leave the garage at 80% state of charge (SOC) and charge each time through the SCC Transit Center for the maximum available layover (minus docking time) up to a total of 25 minutes.

***Figure 18:* City Line Charging – Scenario 2**



In the final scenario, shown in **Figure 19**, BEBs initially leave the garage with a full charge but only charge at the SCC Transit Center when they are below a 70% SOC for the maximum available layover (minus docking time) up to a total of 25 minutes.

Figure 19: **City Line Charging – Scenario 3**



Results from each of the scenarios indicates that it is feasible to operate the City Line service as detailed in **Table 14** with the eleven (11) vehicles under strenuous conditions by charging at the Northwest Boone Garage using the high capacity charger and on-route at the SCC Transit Center although several buses drop below 50 kWh of remaining energy.

Further block analysis completed in 2024 to evaluate extreme weather conditions (e.g. sustained cold temperatures from -10 degrees F to 1 degree F) and service changes, indicated energy use up to 6.5 kWh/mi. Under these challenging conditions, 6 of 9 blocks are unable to complete the daily service with on-route charging. As a result, STA is evaluating service changes during these very infrequent challenging conditions.

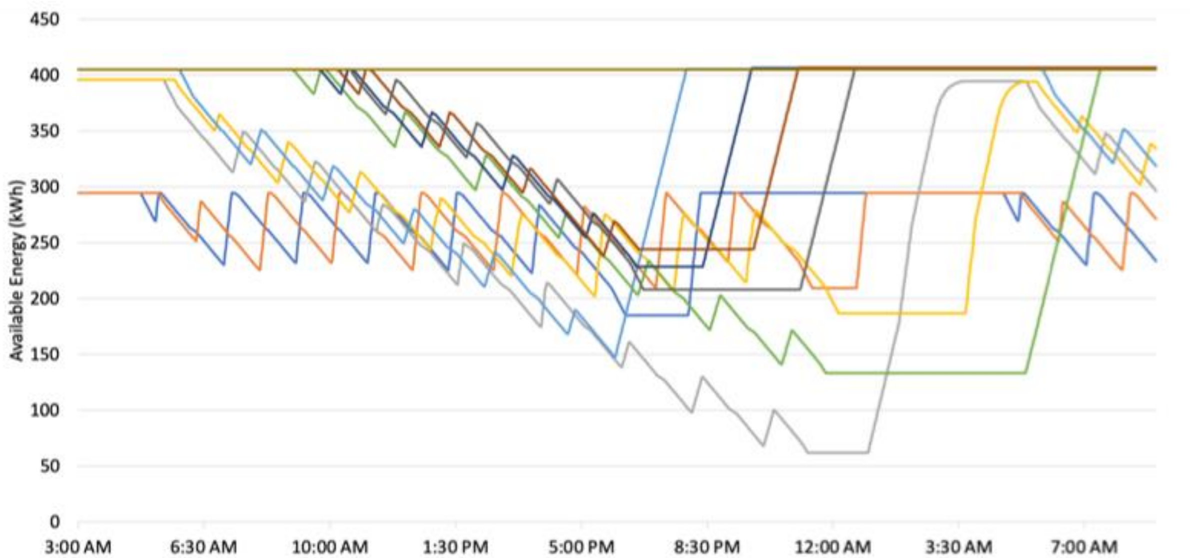
Monroe-Regal Line

The Monroe-Regal Line is proposed to operate fully electric using ten (10) BEBs that include:

- Two (2) 40' Proterra – 440 kWh long-range battery
- Two (2) 40' New Flyer – 320 kWh high-power battery
- Six (6) 40' New Flyer – 440 kWh long-range battery

Results from the evaluation are included in **Figure 20** below.

Figure 20: **Monroe-Regal Line Charging**



As with the City Line, BEBs may charge at the Northwest Boone Garage either using plug-in or high capacity chargers and charge on-route at the Moran Station Park and Ride using two (2) 450 kW high capacity chargers. For this analysis, it was assumed that the depot charging is only completed using a high capacity charger. Results indicate that the BEBs are able to complete all of the blocks using the available chargers under strenuous conditions; however, results indicate that the New Flyer fast charging buses should be scheduled to operate the most challenging blocks (45, 47, and 48).

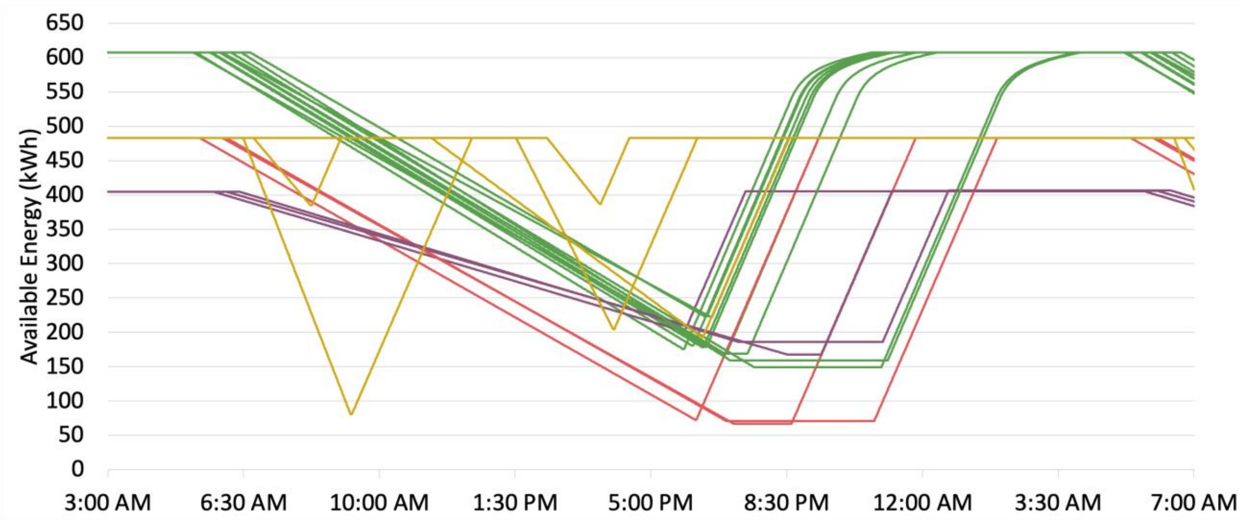
Northwest Boone Garage Plug-In Charging

Analysis of the planned BEBs that are not scheduled to be charged on-route was completed to determine if the remaining 19 buses could effectively be charged with the ten (10) planned plug-in chargers. Details of the BEBs that are not planned for on-route charging are as follows:

- Three (3) 35' New Flyer – 440 kWh long-range battery
- Three (3) 40' New Flyer – 520 kWh long-range battery
- Ten (10) 40' Proterra – 675 kWh long-range battery
- Three (3) 60' New Flyer – 520 kWh long-range battery

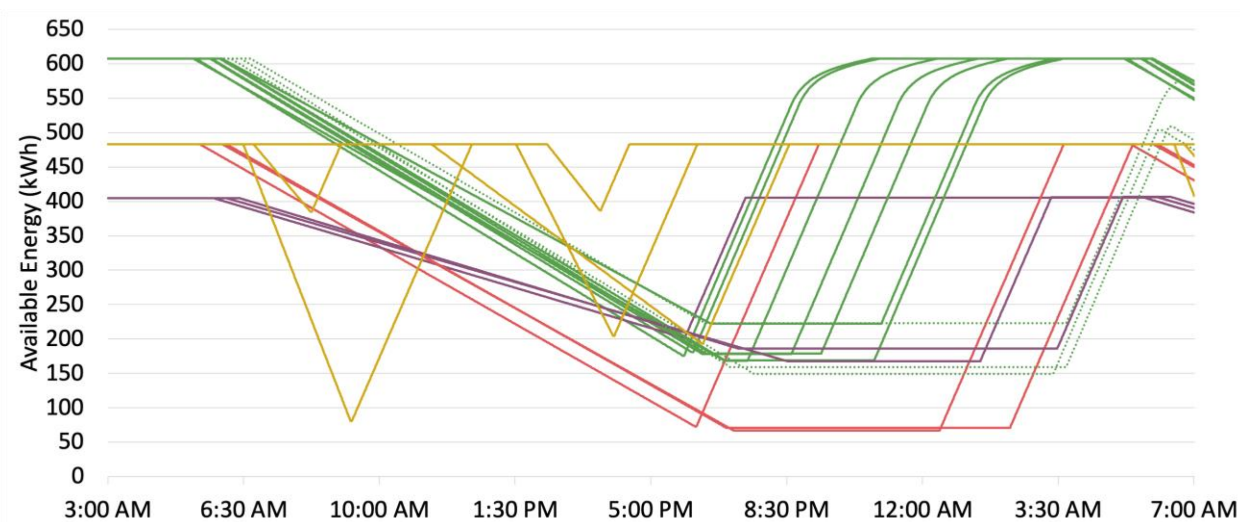
Results from the analysis are included in **Figure 21** below. Results indicate that all BEBs can be charged in the allotted time at the Northwest Boone Garage using the ten (10) available chargers.

Figure 21: **Northwest Boone Garage Charging (10 Chargers)**



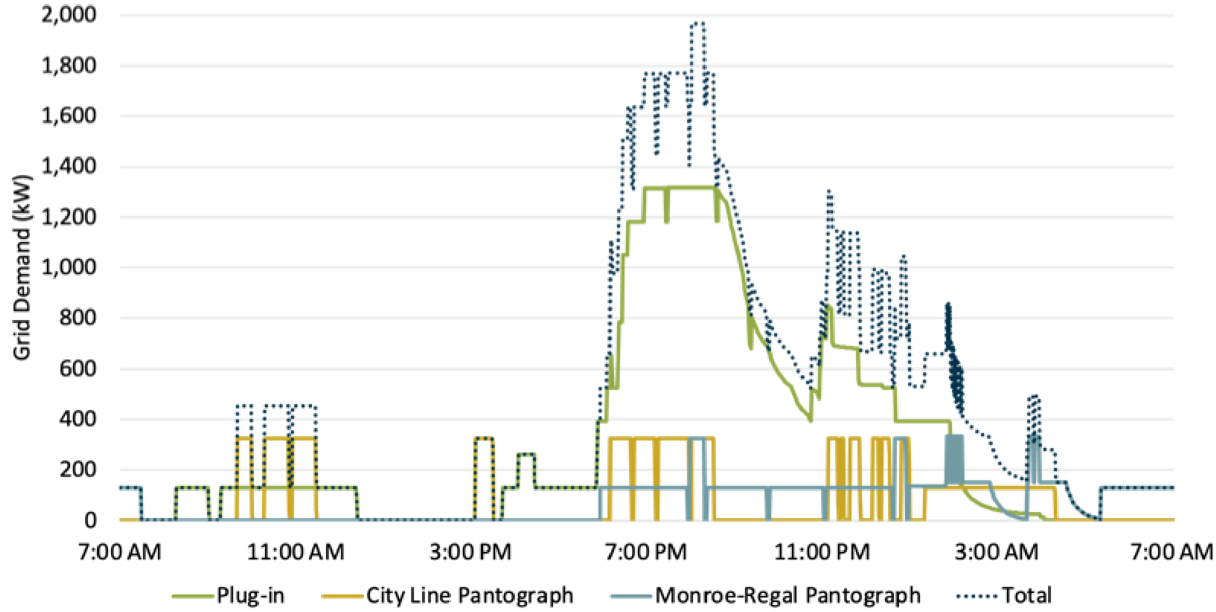
Further evaluation was complete to determine if all of the buses could be charged with only the five (5) existing chargers; however, results provided in **Figure 22** indicate that some buses do not fully charge prior to going back into service the following day.

Figure 22: **Northwest Boone Garage Charging (5 Chargers)**



Grid demand was estimated for the Northwest Boone Garage assuming all forty (40) of the BEBs are in operation. Results are depicted in **Figure 23**.

Figure 23: **Grid Demand at Northwest Boone Garage**



Demand analysis indicates that an estimated grid demand of 2 MW is expected at the Northwest Boone Garage with all chargers and BEBs in operation. It should be noted that this is the expected demand, not the total connected load of all of the chargers (estimated at 2.4 MW).

Section 10 – Fuel Assessment

The objective of the updated Fuel Assessment is to estimate fuel use and costs associated with each of the transition scenarios. CTE updated assumptions used to complete this assessment and performed a sensitivity analysis associated with the cost of hydrogen.

The terms “fuel” and “energy” are used interchangeably in this analysis, as ZEB technologies do not always require traditional liquid fuel. For clarity, in the case of BEBs, “fuel” is electricity, and costs include energy, demand and other utility charges. The primary source of energy for a BEB comes from the local electrical grid. Utility companies charge separate rates for total electrical energy used and the maximum electrical demand on a monthly basis. As more buses, and chargers, are added to a system, both the energy used and the demand increase. Rates also vary throughout the year and throughout the day (also called time of day rates); this makes costs highly variable. Costs not only depend on seasonal differences like temperature or local school schedules, but also the time of day that buses are charged.

FCEBs are more similar to diesel vehicles as they are fueled by a gaseous or liquid hydrogen fuel. In addition to the cost of the fuel itself, however, there are additional operational costs associated with the hydrogen fueling station that must be considered. Operation and maintenance costs to maintain fueling infrastructure are built into the Fuel Assessment.

Fuel Assessment Assumptions

The primary source of energy for a BEB comes from the local electrical grid (Avista). Utility companies charge separate rates for total electrical energy used and the maximum electrical demand on a monthly basis.

Fuel cost estimates are based on the assumptions listed in **Table 15**. **Table 16** is a summary of the current Schedule 23 EV Rate Structure from the utility provider Avista.

Table 15: Fuel Assessment Assumptions

Fuel	Cost	Reference
Diesel	$3.99/gallon	STA 2023 costs
Hydrogen (delivered liquid)	$9.00/kilogram (kg)	Current CA costs

Table 16: Avista Schedule 23 EV Rate Structure

Charge Type	Amount
Basic Charge	$600/meter
On-Peak Energy Charge	$0.16531/kWh
Off-Peak Energy Charge	$0.0675/kWh
Demand Charge	None

Hydrogen Fuel Cost Projections

There are several recent developments that may significantly impact hydrogen fuel costs including the Department of Energy's Regional Hydrogen Hub Program, which involves a substantial investment of $8 billion. Potential projects in the region associated with this program include the Pacific Northwest Regional Hydrogen Hub (PNWH2 Hub)[2], Obsidian Renewables[3], Douglas County PUD's Renewable Hydrogen Production Facility[4], and the establishment of a Hydrogen Valley[5].

To assess the sensitivity of these costs, an evaluation was conducted considering an annual per kilogram hydrogen cost reduction of 3% annually starting in 2025. This analysis aims to capture the potential impact of future advancements and efficiencies in hydrogen production and distribution technologies as well as growth in hydrogen production and distribution in the region. By incorporating this sensitivity evaluation, this Fuel Assessment can account for potential fluctuations in hydrogen fuel costs.

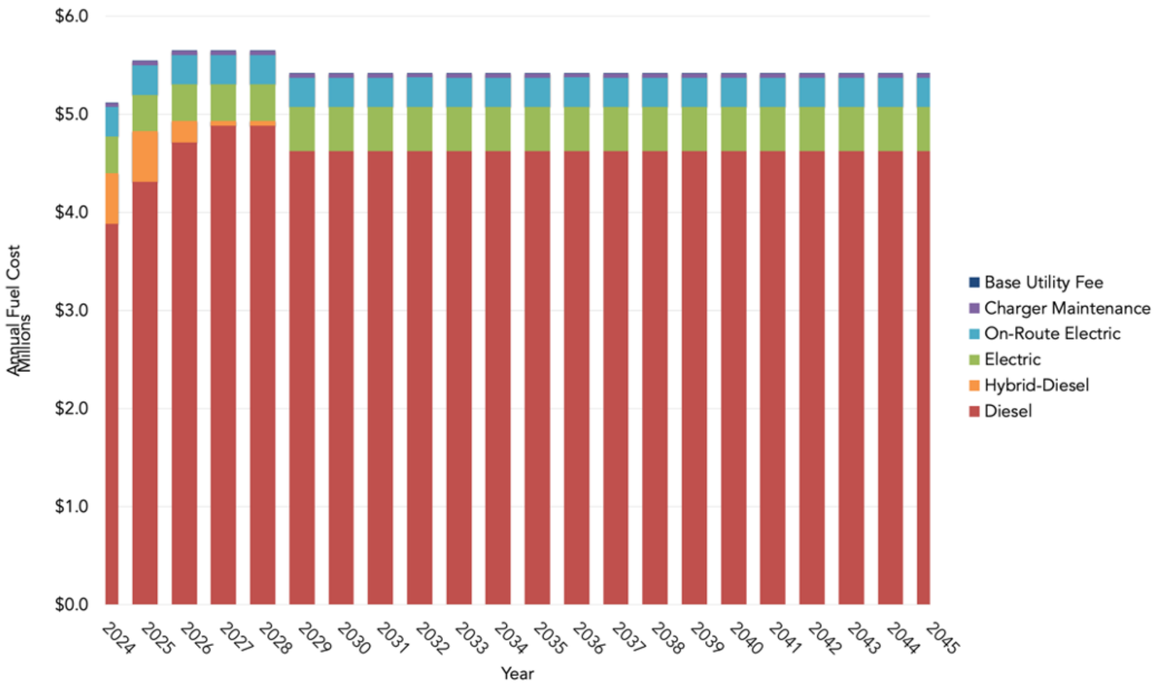
Cumulative Fuel Costs

Inputs from the fleet transition schedule/composition, fuel cost assumptions, and energy rate plans available from Avista were used to calculate the costs for each fuel type (diesel, electricity, and hydrogen) throughout the transition period.

As depicted in **Figure 24**, The baseline scenario results in a total fuel cost of approximately $120 million, or an average of $5.7 million annually.

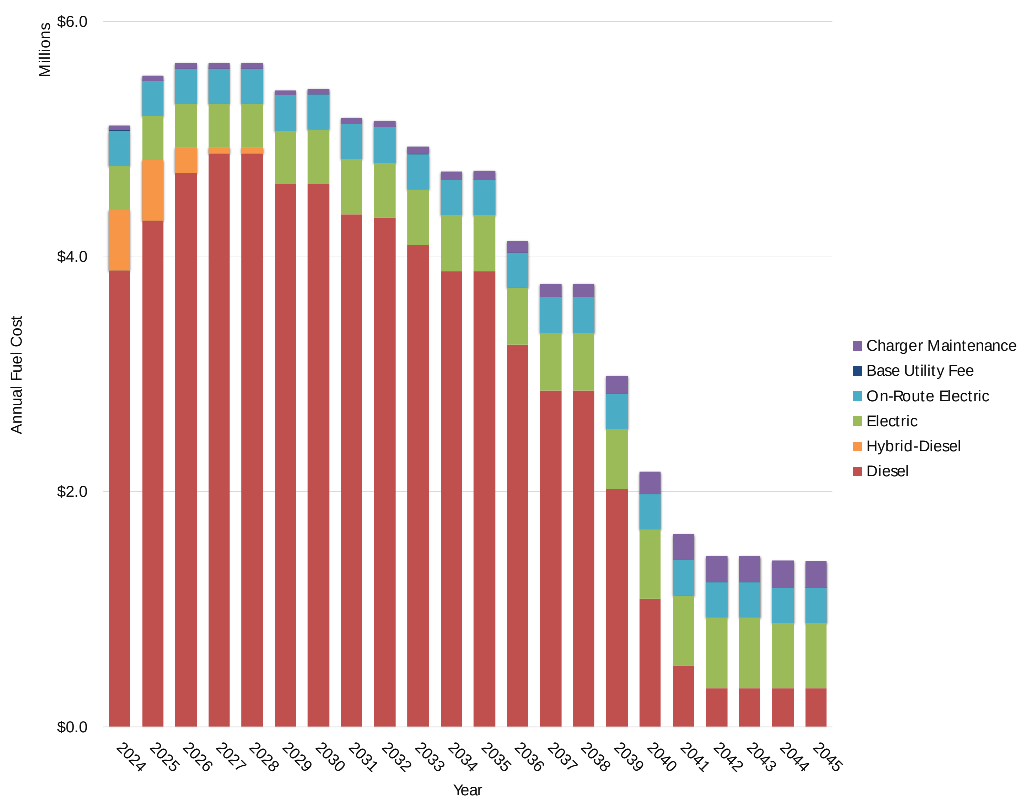
[2] https://pnwh2.com
[3] https://www.obsidianrenewables.com/projects.html
[4] https://douglaspud.org/about-us/hydrogen-facility/
[5] *https://www.opb.org/article/2022/05/14/hydrogen-valley-vision-for-southwest-washington-gets-boost-from-aussies-proposed-plant/*

Figure 24: Baseline Fuel Costs



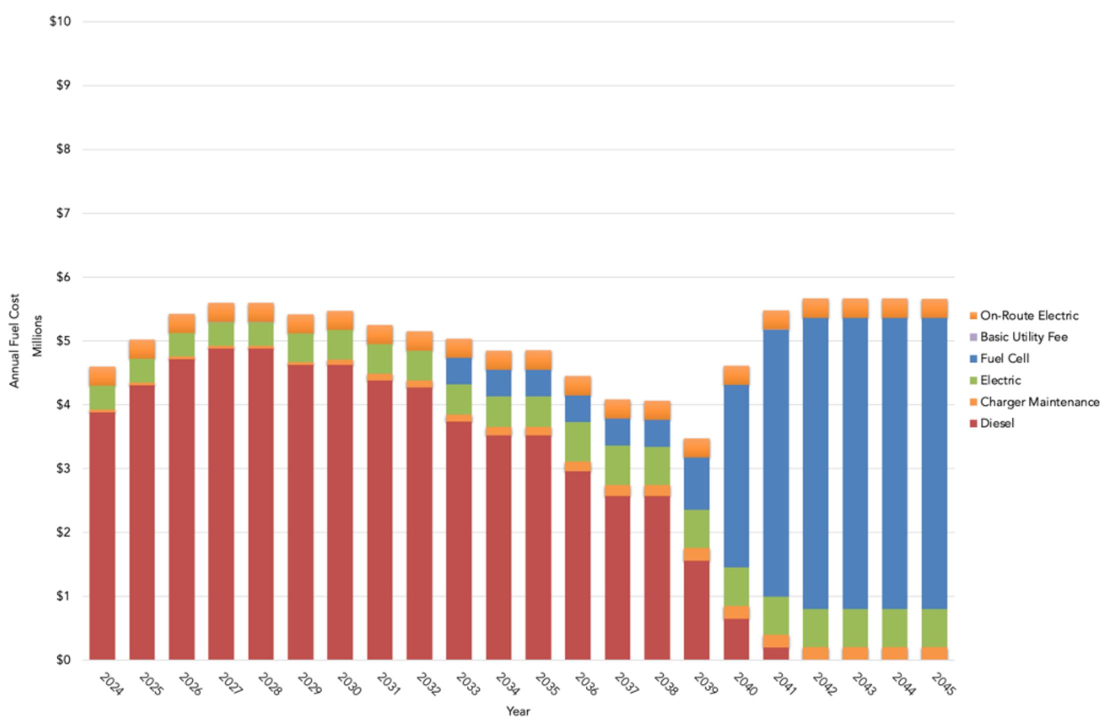
The BEB Depot Only scenario (Scenario 1), depicted in **Figure 25**, yields the lowest anticipated total fuel costs of approximately $87 million, or $4.2 million annually.

Figure 25: BEB Depot Only (Scenario 1) Fuel Costs



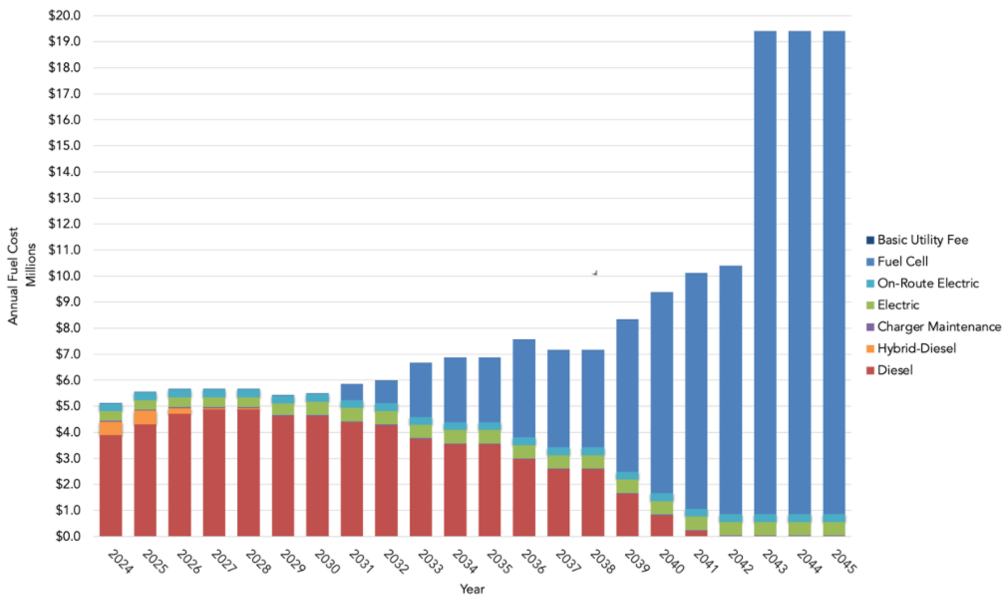
The total fuel costs projected for the BEB Depot and FCEB (Scenario 2) is estimated at approximately $112 million, or $5.3 million annually, as depicted in **Figure 26**.

Figure 26: BEB Depot and FCEB (Scenario 2) Fuel Costs



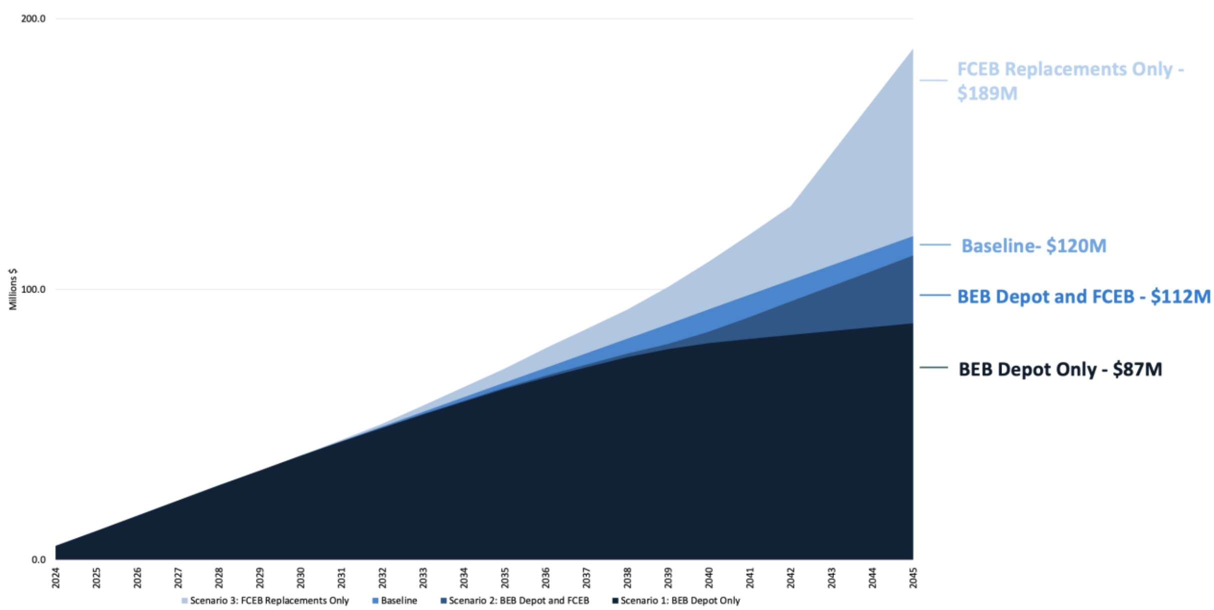
The FCEB Replacements Only scenario (Scenario 3) represents the highest total fuel cost, reaching approximately $189 million by the end of the transition period, or an average annual cost of approximately $9M as depicted in **Figure 27**.

Figure 27: FCEB Replacements Only (Scenario 3) Fuel Costs



Results for all of the scenarios are included in **Figure 28**.

Figure 28: Cumulative Fuel Cost Summary



A sensitivity analysis was completed for the cost of hydrogen that include both the BEB Depot and FCEB and the FCEB Replacements Only scenarios. **Figure 29** below shows the anticipated cost of hydrogen across the transition period, as more hydrogen fuel cell vehicles are added to STA's fleet for the BEB Depot and FCEB scenario. The green line represents the cost of hydrogen across the transition period assuming an anticipated 3% annual decrease, totaling $17 million. The blue line assumes a constant cost of $9.00 per kilogram with the total reaching $29 million by the end of the transition timeline (a $12 million difference).

Figure 29: BEB Depot and FCEB – Hydrogen Cost Sensitivity Evaluation (Scenario 2)

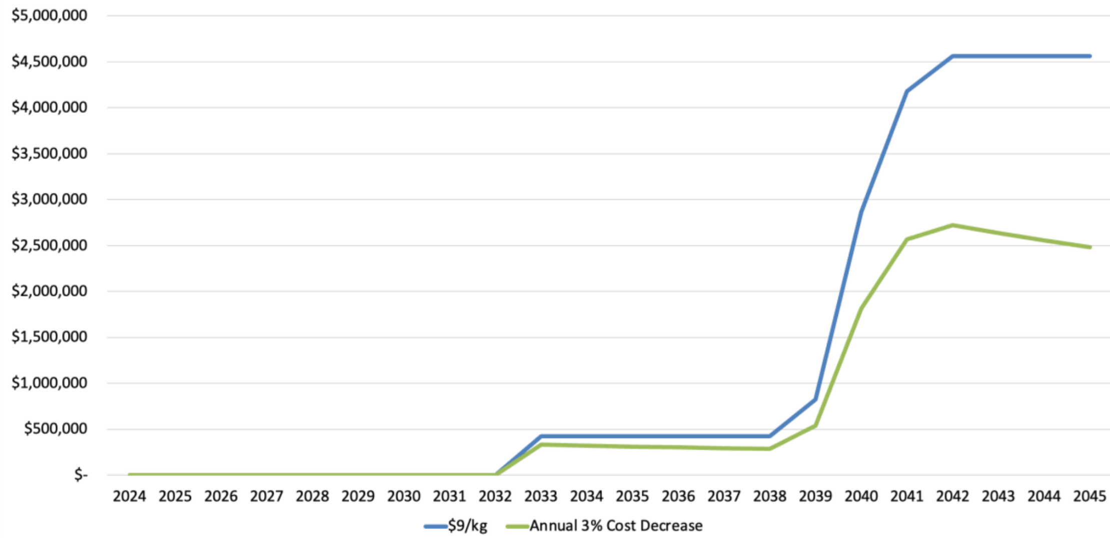
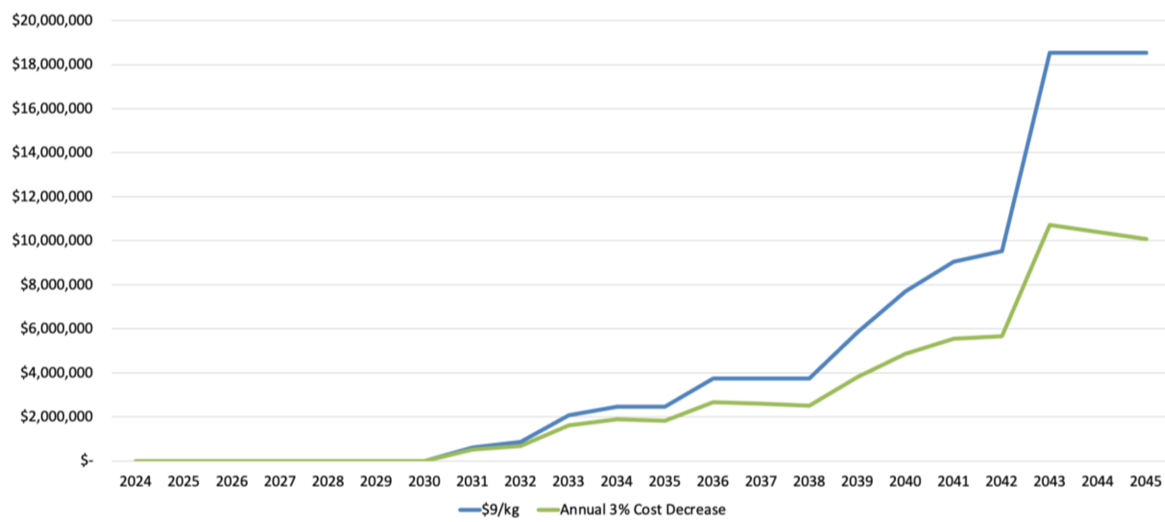


Figure 30 shows the anticipated cost of hydrogen across the transition period as more FCEBs are added to STA's fleet for the FCEB Replacements Only scenario. The blue line, showing a constant cost of $9.00 per kilogram, results in a total cost of $107 million. The green line, showing an annual 3% decrease in the cost of hydrogen, results in a total cost of $65 million, representing a $42 million price difference.

Figure 30: FCEB Replacements Only Sensitivity Evaluation (Scenario 3)



The results of this sensitivity evaluation demonstrate the impact of the price per kilogram of hydrogen throughout the transition period on the total fuel cost. These projections are more conservative than those associated with the Regional Hydrogen Hub Program of less than $1 per kilogram production cost (not retail) in the next decade.

Section 11 - Facilities Assessment

Once bus and fueling requirements are understood for the ZEB transition, the requirements for supporting infrastructure were determined including the charging equipment for BEBs and/or hydrogen fueling equipment for FCEBs. The Facilities Assessment determines the scale of charging and/or hydrogen infrastructure necessary to meet the demands of the projected fleet and energy use estimated in the Fleet and Fuel Assessments, as well as all associated costs with installation of this infrastructure.

Current BEB Charging Infrastructure

With pilot BEB deployments, charging requirements are met relatively easily with a handful of plug-in pedestal chargers and minimal infrastructure investment. Scaling to a fleetwide BEB deployment requires a substantially different approach to charging and infrastructure upgrades. Plug-in charging may no longer be practical as charger dispensers installed in the parking area may create a hazard. Instead, an alternative approach is to use overhead pantograph or reel dispensers attached to gantries or to existing overhead roof structures like at the Northwest Boone Garage. As discussed in the Charging Analysis section, the Northwest Boone Garage currently has five (5) 150 kW ABB chargers, each equipped with two plug-in dispensers for sequential charging, as well as two (2) 450 kW ABB high capacity overhead chargers with drop down pantographs. STA currently has plans to install five (5) additional 150 kW ABB plug in chargers equipped with two (2) dispensers each in the garage as well. The SCC Transit Center (City Line) and Moran Station Park and Ride (Monroe-Regal) are each equipped with two (2) 450 kW ABB high capacity overhead chargers with drop down pantographs for on-route charging of BEBs. Based on discussions with STA, with the addition of the five (5) additional 150 kW plug-in chargers, electrical capacity provided by Avista has been reached with no ability to install additional chargers at the facility.

BEB Charging Infrastructure Assumptions

The BEB infrastructure cost estimates were developed assuming that all new charging will occur at a new facility location that is expected to be constructed by 2029. Cost estimates assume that charging will be installed at the time of construction of the new facility. Chargers are assumed to be 150 kW with two (2) dispensers each mounted with drop down pull cables or reals similar to the current infrastructure at the Northwest Boone Garage. Two (2) additional high capacity chargers (450 kW with drop down pantograph) are assumed to support the proposed future BRT service at a future transit center. The cost estimates include the costs for switchgear, charging infrastructure, and construction and commissioning, but do not include the costs for service expansion that could be required from Avista (or other utility supplier depending on the location of the facility). As the location of the future transit center is still being evaluated, the available electrical capacity is unknown at this time.

Rough-order-magnitude (ROM) cost estimates developed to build out charging options were based on work completed previously for the Northwest Boone Garage as well as recent costs developed for build outs at other locations across the country (San Diego Metropolitan Transit System, Broward County Transit, ABQ RIDE). All cost estimates for BEB infrastructure should be considered a Class IV estimated with an accuracy range of -30% to +50%.

A ROM estimate was developed for the Baseline to build out charging capacity at a future depot for overnight charging of BRT buses that are planned in the Baseline. In addition to the estimated $3.4M for depot buildout as shown in **Table 17**, approximately $1.5M is estimated for installation of two (2) on route chargers at a future transit center to support on-route charging of the BRT. As a result, the total ROM estimate for the Baseline is approximately $4.9M. The costs for the Baseline charging infrastructure are the same as those for the FCEB Replacements Only scenario, as both scenarios are only addressing BEB charging that is already planned.

Table 17: ROM Estimate for Depot Charger Construction - Baseline

Item	Units (EA)	Unit Cost ($)	Total Cost ($)	Source
Depot Charger Purchase – includes charger and 2 dispenser boxes	10	150,000	1,500,000	ABB
Electrical and Charger Install- includes switchgear, 3-phase feeders and breakers, low voltage conduit, communications	10	85,000	850,000	Unit Cost based on similar project
Indirect Costs (General Contractor) – mobilization/demob, overhead, profit, bonding, insurance	1	289,000	289,000	34% of installation
Service Feed Installation	1	100,000	100,000	Engineer's Estimate
Design	1	136,950	136,950	5% of project total not including contingency
Contingency	1	547,800	547,800	20% of construction costs
TOTAL			**3,423,750**	

The ROM estimate developed for the BEB Depot Only scenario assumed a total of 70 x 150 kW plug-in chargers each equipped with two (2) dispensers to support charging of up to 140 vehicles, including overnight charging of the future planned BRT vehicles. In addition to the estimated $23.2M for depot buildout of charging infrastructure, approximately $1.5M is estimated for installation of two (2) on route chargers at a future transit center to support on-route charging of the BRT. As a result, the total ROM estimate for the charging infrastructure for the BEB Depot Only scenario is approximately $24.7M. Details for the cost estimate for the depot installation are included in **Table 18**. As noted previously, these costs do not include potential costs associated with development of additional capacity that the utility may charge.

Table 18: ROM Estimate for Depot Charger Construction – BEB Depot Only

Item	Units (EA)	Unit Cost ($)	Total Cost ($)	Source
Depot Charger Purchase – includes charger and 2 dispenser boxes	70	150,000	10,500,000	ABB
Electrical and Charger Install- includes switchgear, 3-phase feeders and breakers, low voltage conduit, communications	70	85,000	5,950,000	Unit Cost based on similar project

Indirect Costs (General Contractor) – mobilization/demob, overhead, profit, bonding, insurance	1	2,023,000	2,023,000	34% of installation
Service Feed Installation	1	100,000	100,000	Engineer's Estimate
Design	1	928,650	928,650	5% of project total not including contingency
Contingency	1	3,714,600	3,714,600	20% of construction costs
TOTAL			**23,216,250**	

The ROM estimate developed for the BEB Depot and FCEB scenario assumed a total of 45 x 150 kW plug-in chargers each equipped with two (2) dispensers to support charging of up to 90 vehicles, including overnight charging of the future planned BRT vehicles. The remainder of the fueling at the new depot will be provided by hydrogen to support FCEB operations as detailed in the following section. In addition to the estimated $13.9M for depot charger buildout, approximately $1.5M is estimated for installation of two (2) on route chargers at a future transit center to support on-route charging of the BRT. As a result, the total ROM estimate for charger buildout for the BEB Depot and FCEB scenario is approximately $15.4M. Details for the cost estimate for the depot installation are included in **Table 19**. As noted previously, these costs do not include potential costs associated with development of additional capacity that the utility may charge.

Table 19: ROM Estimate for Depot Charger Construction – BEB Depot and FCEB

Item	Units (EA)	Unit Cost ($)	Total Cost ($)	Source
Depot Charger Purchase – includes charger and 2 dispenser boxes	45	150,000	6,750,000	ABB
Electrical and Charger Install- includes switchgear, 3-phase feeders and breakers, low voltage conduit, communications	45	85,000	3,825,000	Unit Cost based on similar project
Indirect Costs (General Contractor) – mobilization/demob, overhead, profit, bonding, insurance	1	1,300,500	1,300,500	34% of installation
Service Feed Installation	1	100,000	100,000	Engineer's Estimate
Design	1	392,500	392,500	5% of project total not including contingency
Contingency	1	1,570,000	1,570,000	20% of construction costs
TOTAL			**13,938,000**	

FCEB Infrastructure

A primary advantage of FCEBs is that fueling operations with hydrogen are similar to diesel or CNG fueling operations. As with electric, rather than building out the infrastructure all at once, projects are sized and scheduled to meet the near-term fueling requirements. There are three primary ways that hydrogen can be delivered as depicted in **Figure 31**.

Figure 31: Hydrogen Delivery

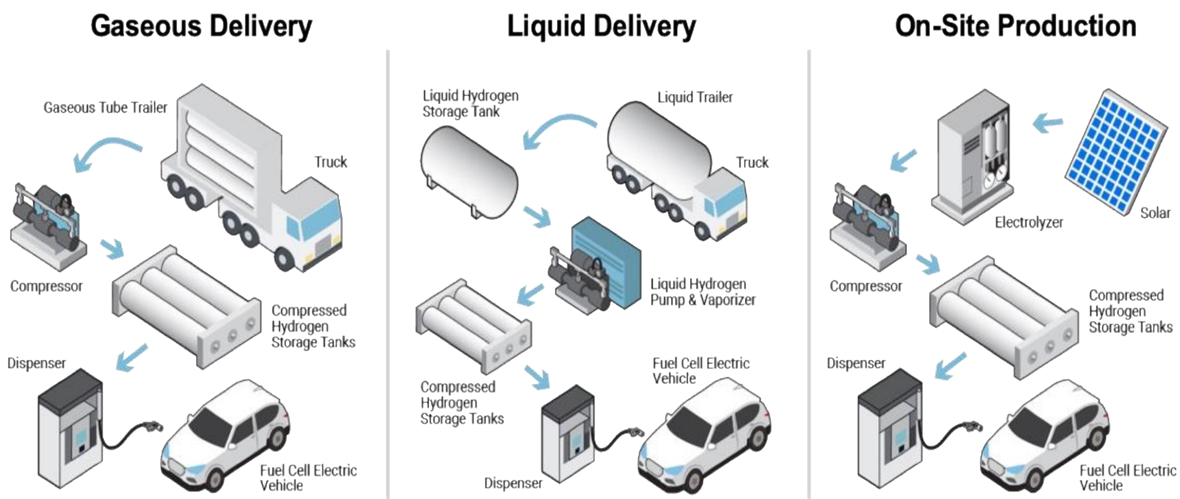


Figure 5. Summary of hydrogen fueling station delivery options (Image source: California Fuel Cell Partnership)

Hydrogen can be delivered either as a gas or as a liquid. Although gaseous hydrogen is more readily available today, it is not generally available in quantities that would support a large scale deployment of buses. In addition, liquid hydrogen is much more energy dense, therefore more energy can be stored on-site to support operations. Photos provided in **Figure 32** depict liquid hydrogen storage and fueling infrastructure at the Orange County Transportation Authority (top) and AC Transit (bottom).

Figure 32: Hydrogen Storage and Dispensing Examples

A third option is the on-site production of hydrogen through steam methane reformation (SMR) or electrolysis. SMR, utilizing methane, water, and heat, is the cheapest and most common method for hydrogen production in the United States today; however, significant quantities of carbon dioxide are produced as a bioproduct. Electrolysis utilizes water and energy to produce hydrogen with the only biproduct being oxygen. This is the preferred alternative for hydrogen production, particularly if it is produced using renewable energy sources. This is often referred to as green hydrogen and is 100% zero-emission. The United States government has made significant investment in building out hydrogen production infrastructure with $8 billion in funding for the Regional Hydrogen Hub program as well as providing tax incentives for producers/suppliers of green hydrogen.

Hydrogen fueling operations for STA assume trucking of liquid hydrogen to the depot, on-site storage at the depot, and the associated fueling equipment. Infrastructure costs were based on similar projects either completed to date or currently scoped. Upgrades to maintenance facilities including ventilation, electrical, lighting, and hydrogen detection equipment were not included in these estimates as it is assumed that the new facility would be designed to accommodate these safety design needs.

A mobile fueler, provided by a third-party hydrogen supplier, could be used to support the deployment of the first approximately ten (10) FCEBs. A mobile fueler consists of the equipment to store, compress, chill, and dispense hydrogen fuel to the buses. The fuelers are typically zero emission and do not require utility hook ups. Liquid hydrogen can be delivered by truck to the fueler. A pilot project utilizing a mobile fueler may be considered as it would give STA insight into long-term operations of hydrogen fueling in STA service. A photo of mobile fueling equipment provided by Air Products is included in **Figure 33**. Under the next phase of work, a scope and estimated costs for a mobile fueling project will be developed for STA consideration.

Figure 33: Mobile Hydrogen Fueling Trailer

In order to support a growing FCEB fleet beyond ten (10) vehicles, Phase I of permanent hydrogen fueling infrastructure would include installing a 25,000-gallon liquid hydrogen tank, two vaporizers, two pumps, and one assembly of high-pressure gaseous hydrogen storage vessels. These assumptions were based on an assumed fueling time of 12 to 18 minutes per bus, depending on the hydrogen storage capacity of the bus, and approximately two to three days of hydrogen storage. The footprint for this equipment is estimated to be approximately 30’ x 90’. Two (2) dispensers would initially be installed with the ability to add additional dispensers as the fleet grows. To improve resilience, the hydrogen design would include a backup generator to operate the fueling equipment. Phase II of the installation of the hydrogen fueling infrastructure would involve adding additional liquid hydrogen storage, as necessary, and accompanying vaporization, pumping, and dispensing equipment. The equipment compound size would approximately double. A maximum of six (6) dispensers are expected to be required to support a full fleet of 128 FCEBs (and 59 BEBs). Detailed performance evaluation and design would be required to support the build out of hydrogen fueling infrastructure at a new facility. ROM costs for Phase I installation, which supports the BEB Depot and FCEB scenario is estimated at approximately $7M. Phase II of the installation, that would support the FCEB Replacements Only scenario is estimated at $13M.

Total infrastructure upgrade costs including both BEB charging and hydrogen fueling needs for the Baseline, BEB Depot Only, BEB Depot and FCEB, and FCEB Replacements Only scenarios are provided in **Table 20**. Please note that the charging infrastructure costs include redundant chargers but do not include backup generation in the event of power loss. Further evaluation and discussion will be required with Avista to determine options for resilience for a full build out. The hydrogen fueling options include backup power to allow hydrogen dispensing during power loss.

Table 20: Estimated Infrastructure Costs (ROM Estimates, -30% to +50% Range)

Scenario	Electrical Infrastructure ($)	Hydrogen Infrastructure ($)	Total Infrastructure ($)	% ZEB Fleet
Baseline	$4.9M	-	$4.9M	32%
BEB Depot Only	$24.7M	-	$24.7M	95%
BEB Depot and FCEB	$15.4M	$7M	$22.4M	100%
FCEB Replacement Only	$4.9M	$13M	$17.9M	100%

Section 12 – Emissions Assessment

The goal of the Emissions Assessment is to estimate the emissions associated with each of the scenarios by quantifying the diesel gallons reduced and the carbon dioxide production, reductions, and net savings.

A primary benefit of transitioning an entire fleet from fossil-fuel vehicles to zero-emission is the reduction of greenhouse gas (GHG) emissions. GHG emissions consist primarily of carbon dioxide (CO_2) but also include small amounts of methane (CH_4) and Nitrous Oxide (N_2O). In the transportation sector the vast majority of GHG emissions is from CO_2. For completeness, total GHG emissions are also calculated but the primary focus is on reduction of CO_2.

The primary sources of data to support this analysis are listed below:

- Calculation data from Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool
- Hydrogen emissions from natural gas SMR and electrolysis
- Avista Grid Mix – power sources utilized to generate electricity

Net Carbon Emissions Reductions

There are three types of emissions generally referred to in the context of zero emission vehicle transportation: well-to-wheel emissions, tailpipe emissions and upstream emissions.

Well-to-wheel emissions (WTW) include all emissions generated by the vehicle during operation *and* emissions generated by the powerplant or refinery to produce the energy used by the vehicle. WTW emissions are present for the generation of nearly all different fuels, be it diesel, gasoline, CNG or electricity, as these fuels require a combination of petroleum, natural gas and coal for their production (except in the case of electricity produced by 100% renewable energy).

Tailpipe emissions include all emissions generated by the vehicle during operation. It is assumed that ZEBs do not produce any tailpipe emissions.

Upstream emissions are generated by the fuel refinery or powerplant during extraction, processing and transportation of the fuel. In this analysis, upstream emissions are calculated by the difference between WTW and tailpipe emissions.

These emissions are calculated using Argonne National Labs' AFLEET tool. Emissions for electricity production uses specific inputs from Avista Utilities (STA's local utility) and estimated local upstream and vehicle emissions from the EPA to better estimate STA's impact. Avista Utilities' energy mix is as follows: Hydroelectric (48%), Natural Gas (33%), Coal (8%), Wind (9%), Biomass (2%).

Emissions Assessment Results

The figure below shows the annual CO_2 emissions for the baseline scenario and each of the three fleet transition scenarios discussed in this report. These results reflect delivered hydrogen produced using natural gas SMR. Additional evaluation was conducted to identify the potential emission savings associated with use of electrolysis to produce hydrogen.

Figure 34: Annual CO_2 Emissions by Scenario

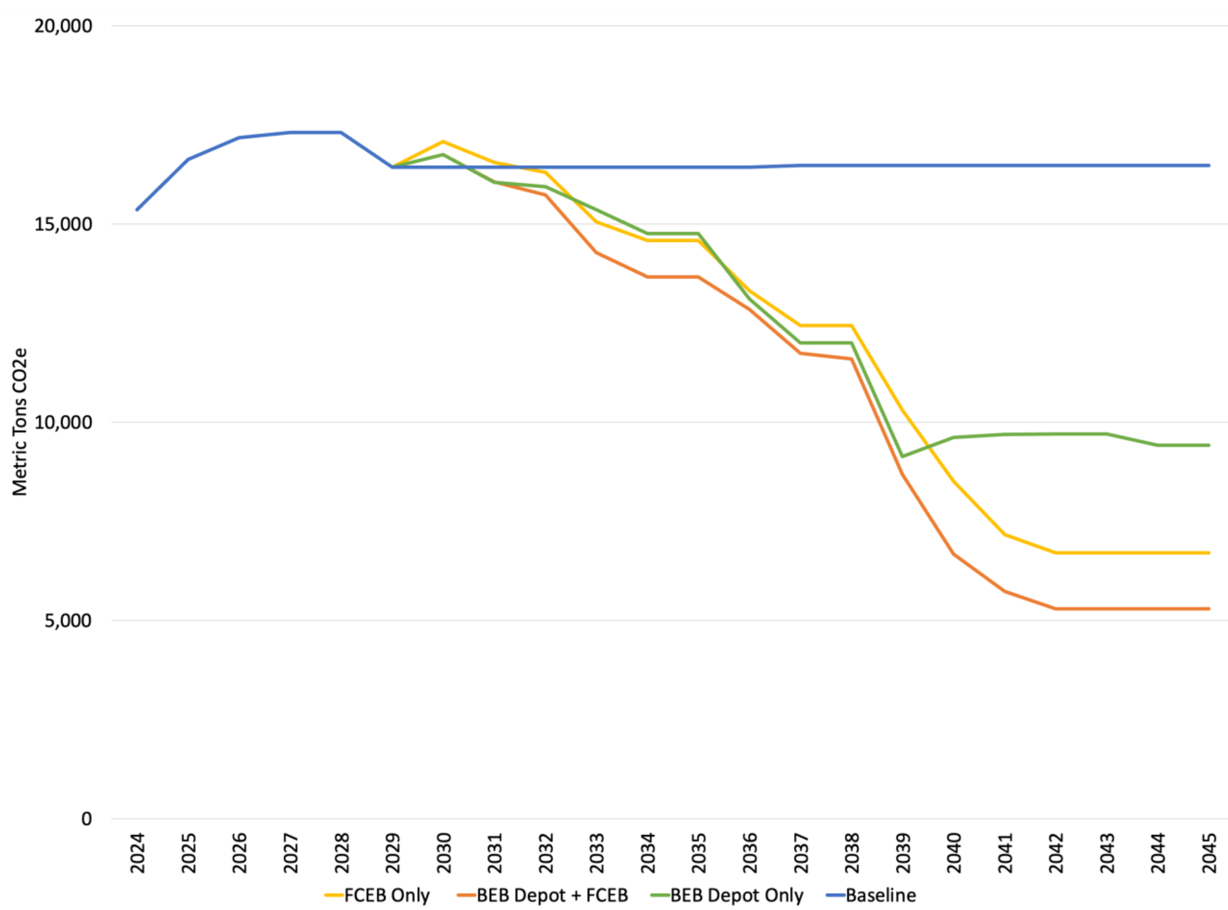


Table 21: Annual CO_2 Emissions Reductions by Scenario

Scenario	Estimated Total (tons CO2)	Reduction from Baseline (tons CO2)	% Reduction
Baseline	363,398	-	-
BEB Depot Only (Scenario 1)	297,589	65,809	18%
BEB Depot and FCEB (Scenario 2)	268,782	94,616	26%
FCEB Replacements Only (Scenario 3)	285,293	78,105	21%

As discussed previously, these estimates reflect the generation of liquid hydrogen using SMR from natural gas. Evaluation was conducted for the BEB Depot and FCEB (Scenario 2) and FCEB

Replacements Only (Scenario 3) to evaluate the additional savings if hydrogen was produced using electrolysis. Results are included in **Figures 35** and **36**.

Figure 35: Emissions Comparison for Hydrogen Generation – BEB Depot and FCEB

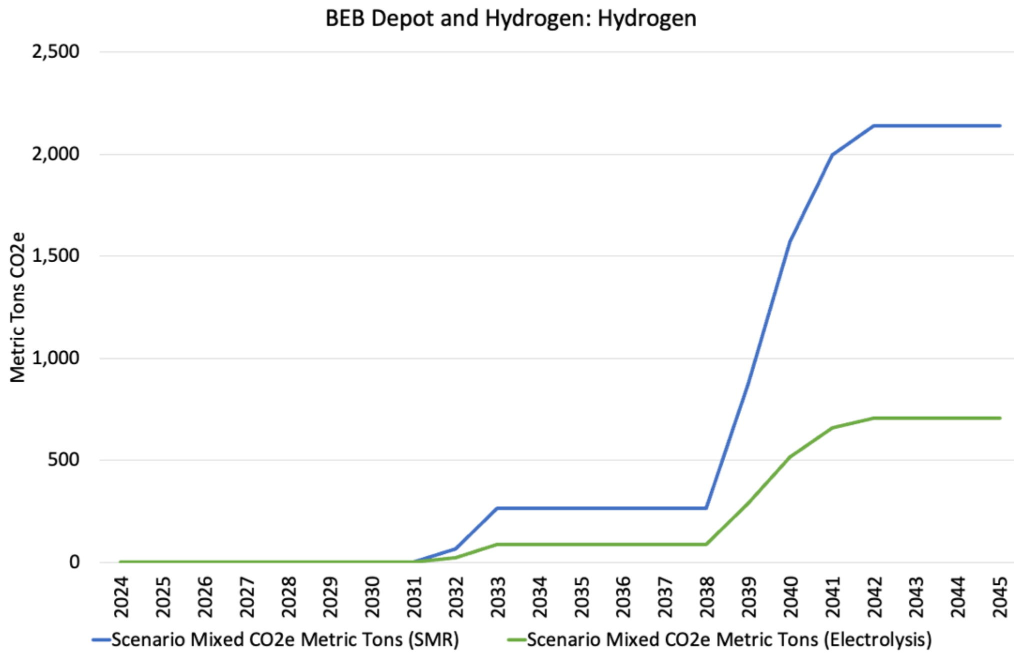
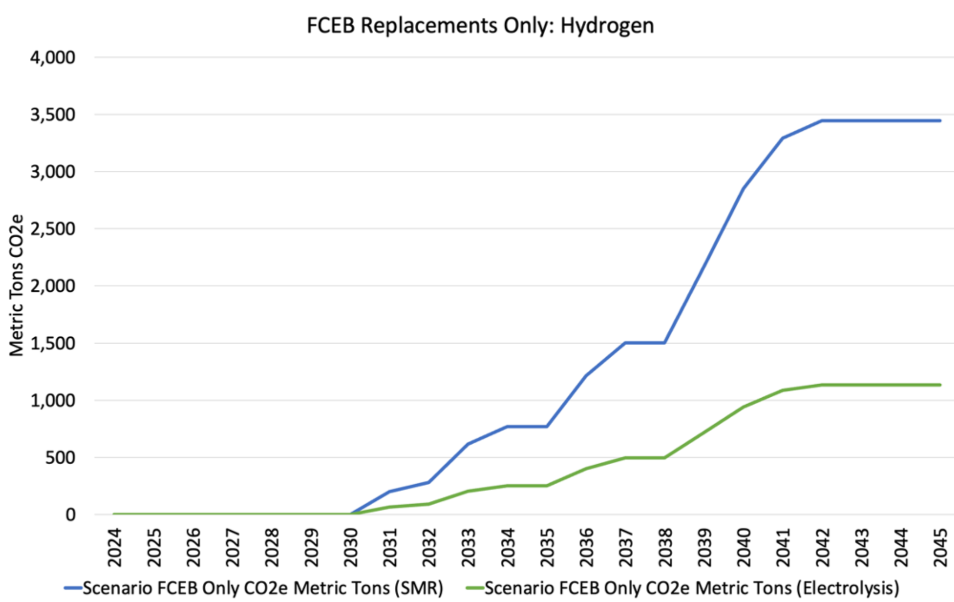


Figure 36: Emissions Comparison for Hydrogen Generation – FCEB Replacements Only



Results indicate an approximate 67% reduction in CO_2 emissions from producing hydrogen through electrolysis rather than SMR.

Social Cost of Carbon

Externality costs of emissions can be quantified by their effect on agriculture, human health, property damage and other related factors. This estimate is widely known as the Social Cost of Carbon, or SCC. Using guidance developed by the Washington State Department of Commerce in *The Social Cost of Carbon: Washington State Energy Office Recommendation for Standardizing the Social Cost of Carbon When Used for Public Decision-Making Processes* prepared in 2014, the SCC for each scenario was calculated and provided in Table X below. The costs shown are calculated using the projected emissions savings, based on a 2.5% discount rate as recommended in the guidance and converted to 2023 dollars based on inflation. This equates to a cost per metric ton of $97.42 in 2023 dollars.

Table 22: Estimated Social Cost of Carbon Savings

Scenario	Estimated Emissions (tons CO_2)	Net Emissions Reduction (tons CO_2)	SCC Savings Estimate (2023$)
Baseline	363,398	-	-
BEB Depot Only	297,589	65,809	$6.4M
BEB Depot and FCEB	268,782	94,616	$9.2M
FCEB Replacements Only	285,293	78,105	$7.6M

Emissions Reductions in Perspective

Finally, it is useful to view the potential emissions reductions from converting a fleet to BEB in terms of other methods of removing carbon from the air. These "equivalencies" are often used as an aid in communication and visualization of the benefits to various stakeholders who may be involved in decision making regarding a project such as this. In this case, the number of trees that it would take to remove amounts of CO_2 from the atmosphere equivalent to the annual reductions expected by converting the fleet to BEBs were calculated. **Figures 37**, **38** and **39** present this information Scenarios 1, 2, and 3, respectively. The number of trees refers to seedlings planted and grown for 10 years, and the number of acres are existing acres of US forests removing CO_2 for one year.

Figure 37: BEB Depot Only - Annual Emission Reduction Equivalencies

Figure 38: BEB Depot and FCEB - Annual Emission Reduction Equivalencies

Figure 39: FCEB Replacements Only - Annual Emission Reduction Equivalencies

Section 13 - Total Cost of Ownership

The Total Cost of Ownership compiles the results from the Service, Fleet, Fuel, Maintenance, and Facilities assessments to provide estimated costs throughout the transition period. It includes selected capital and operating costs of each transition scenario over the transition timeline. There may be other costs incurred (i.e., incremental operator and maintenance training); however, these four assessment categories are the key cost drivers in ZEB transition decision-making.

It is important to note that cost escalation is only assumed for the capital vehicle purchase costs as STA has included a 3% inflation rate in their internal fleet procurement schedule and plan. All other cost categories do not include inflation in the analysis. In addition, cost reductions are not considered for economies of scale related to ZEB technology growth because there is no historical context with which to estimate. Future changes to STA's service level, depot locations, route alignments, block scheduling, etc. are unknown. The provided costs are an estimate, informed by detailed analysis using assumptions explained throughout this study. Also, this Total Cost of Ownership does not consider hydrogen fuel cost sensitivity scenario (3% reduction year over year beginning in 2025). The estimated Total Cost of Ownership for STA's ZEB transition as detailed in this analysis are provided in **Table 23** and **Figure 40**.

Table 23: Total Cost of Ownership for ZEB Transition (2024-2045)

Category	Baseline	BEB Depot Only	Depot BEB and FCEB	FCEB Replacements Only
Fleet	$358M	$465M	$492M	$526M
Maintenance	$293M	$277M	$277M	$277M
Fuel	$120M	$87M	$112M	$189M
Infrastructure	$5M	$25M	$22M	$18M
Total	**$776M**	**$854M**	**$903M**	**$1,009M**
Compared to Baseline	-	$78M	$127M	$233M
% ZEB Fleet	32%	95%	100%	100%

Results from the total cost of ownership analysis indicates that additional costs, expected to be between $78M to $233M more than Baseline, will be required to support a transition to ZEBs, whether BEBs, FCEBs, or a combination of technologies are selected.

Figure 40: Total Cumulative Capital & Operating Costs – All Scenarios (2024-2045)

Section 14 - Funding Needs Assessment

Funding Assessment Overview

STA allocates funds based on an established procurement timeline determined by the useful life of its buses. Transitioning to a zero-emission bus fleet increases overall fleet costs because of the incremental cost of ZEBs, the installation of new infrastructure, and required modifications to maintenance facilities. The current base market cost of 40' zero-emission transit buses is between $750,000 and $1,200,000, which is approximately $250,000 to $700,000 more expensive than diesel buses. Additionally, the necessary infrastructure to support these ZEBs adds to the financial burden of transitioning to a zero-emission fleet.

STA Funding Needs

Over the course of the transition period, STA plans to install charging infrastructure at a new maintenance facility and at an on-route transit center to support BRT service. STA may also consider deployment of hydrogen FCEBs and hydrogen fueling infrastructure in the future depending on availability of low-cost green hydrogen. To achieve these goals and move towards a successful deployment of zero-emission buses, STA projects will require between $490M and $544M in capital funding to cover the procurement of vehicles and infrastructure during the transition time period. This cost estimate includes the necessary costs for the transition, as determined via the cost analyses completed for the Fleet and Facilities Assessments.

Available Funding Resources & Resulting Funding Shortfalls

Based on the funding needs identified above and an assessment of STA's current projections, STA must identify resources that can cover this funding gap. Traditional formula funding will provide support for the transition to a zero-emission fleet (e.g., using formula funds to cover the base price of a zero-emission bus and applying for Low-No funds for the incremental cost difference), but it is likely STA will require additional funding to offset the higher costs associated with zero-emission technology.

STA is prepared to pursue funding opportunities at the federal, state, and local level, as necessary and as available.

Federal Funding sources STA is considering include:

- United States Department of Transportation (USDOT)
    - Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants
- Federal Transportation Administration (FTA)
    - Bus and Bus Facilities Discretionary Grant
    - Low-or No-Emission Vehicle Grant
    - Metropolitan & Statewide Planning and Non-Metropolitan Transportation Planning

- Urbanized Area Formula Grants
- State of Good Repair Grants
- 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
- Volkswagen Environmental Mitigation Trust Funds
- Washington DOT Public Transportation Grants

Other potential future options include:

- Revenue bonds
- Tax increases
- Public-Private Partnerships

Section 15 - Partnership Assessment

Establishing and maintaining a partnership with the local electric utility is critical to successfully deploying zero-emission vehicles and maintaining operations. With the addition of BEBs to a fleet, a transit agency may become a utility's largest customer with added implications for grid-side infrastructure and agency operational costs. Early coordination and discussions can avoid costly delays and misaligned operational strategies while also revealing opportunities for lower operational costs and smart investments. Fortunately, electric utilities are beginning to develop electric vehicle rates and streamlined processes for charging infrastructure interconnections that can support successful zero-emission fleet deployments.

STA has a working relationship with the Avista's Manager of Electric Transportation, Rendall Farley. Avista has provided the necessary utility service for the Northwest Boone Garage and is currently working with STA to evaluate potential future locations for a new storage and maintenance depot. Avista has also established an electrical vehicle charging utility rate that STA is currently utilizing at the Northwest Boone Garage, SCC Transit Center, and Moran Station Park and Ride, for BEB charging. STA recognizes Avista as a critical partner in electrification and will continue to partner with Avista after the planning stages to coordinate fleet expansion efforts effectively.

In addition, STA partnered with New Flyer and Proterra for the deployment of their first BEBs. In addition, Proterra provided the charging infrastructure and design and installation services for the charging equipment at Northwest Boone Garage, SCC Transit Center, and Moran Station Park and Ride as part of a competitive procurement through the Small Starts Grant that supported the City Line BRT service project. STA may continue to partner with qualified OEMs and providers in the future if FCEBs and hydrogen fueling infrastructure is pursued or as part of a hydrogen fueling initial or pilot deployment.

Section 16 - Workforce Analysis

STA is committed to transition to a 100% zero-emission fleet. In order to support ZEB operations at this scale, STA has identified opportunities to ensure the current and future workforce is prepared to manage its full fleet of ZEBs. This Workforce Development Analysis focuses on ZEB operations and maintenance.

In alignment with FTA's requirements under the Workforce Development for the Low No and Buses and Bus Facilities Programs, STA is currently working to build a ZEB workforce program in consultation with labor representatives, and may look to build out an internship and apprenticeship program to address STA's future operational and maintenance needs.

Workforce Analysis Overview

Developing and training the workforce required to operate and maintain ZEBs requires significant investment and planning. STA is experienced in recruiting, hiring, training, and integrating new staff to ensure that employees are qualified to provide quality services. STA recognizes that a trained ZEB workforce is not readily available and the transit industry must address the shortage of technicians and mechanics together.

STA plans to develop and maintain a qualified ZEB staff by hiring qualified new staff and retraining existing staff who have previously worked with ICE systems. Meaningful investment is required to upskill maintenance staff and bus operators that were originally trained in diesel vehicle maintenance and fossil fuel fueling infrastructure. Transitioning to zero-emission vehicles is a paradigm shift for all aspects of transit operations including but not limited to scheduling, maintenance, and yard operations. STA's workforce development activities will address the identified skills and tools needed for each relevant team.

STA is collaborating with labor representatives in developing training needs and a training program for the transition to zero-emission buses.

Completed Trainings

STA's drivers and maintenance technicians have received training through Proterra, New Flyer, and ABB as part of the initial ZEB deployments from 2020 through 2023.

Identified Training Needs

Several training needs have been identified by STA staff in order to support the transition to a 100% ZEB fleet. STA is committed to ensuring new training and technologies do not displace current workers and has placed a priority on training existing staff as well as developing an apprenticeship program. The identified training needs are anticipated to evolve as STA's fleet expands. As such, the following training plans are intended to provide a framework.

1) *Internship and Apprenticeship Programs*
   STA has begun conversation with our human resources department and training department in order to begin preparing a workforce transition plan. We are currently evaluating internships and training programs related to individuals currently in school and at apprenticeship programs for graduates.

2) *Expand the Train-the-trainer approach*
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 minimize the need for external training while maintaining institutional knowledge and providing widespread agency training on new equipment and technologies. STA currently utilizes a Train-the-Trainer approach and will expand the system to support ZEB training. Third party resources will continue to be used as needed.

3) *Vendor training from New Flyer, Proterra, and Charger Suppliers*
STA plans to take advantage of trainings from the bus manufacturers and infrastructure suppliers, including maintenance and operations training, maintenance and safety, first responder training, and other trainings that may be offered by the providers. OEM trainings provide critical information on operations and maintenance aspects specific to the equipment model procured. STA training staff will work closely with the OEMs providing vehicles to ensure all mechanics, service employees, and bus operators complete necessary training prior to deploying ZEB technology. STA 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.

4) *ZEB tools*
The following tools have been identified as top needs to bring in-house as more of the maintenance and management falls to internal staff with an expanded ZEB fleet.
    - Battery lift table
    - Bus Simulator (under consideration)

5) *ZEB Training from other transit agencies*
STA will consider zero-emission training offered by other transit agencies. 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. STA is considering taking advantage of these trainings offered by experienced agencies.

6) *National Transit Institute training*
STA will consider NTI course training if zero-emission specific training courses are offered.

7) *Local Partnerships and Collaborations*

Resources and Strategies to Meet Identified Needs

STA envisions needing resources to address the above identified training programs. As STA continues to develop the Workforce Development Plan, these resources and funding needs will be identified.

Workforce Development Timeline

Demand for skilled and experienced workers will increase rapidly as new clean transportation policies and programs take effect and as numerous agencies begin fleet transitions. Aligning workforce development activities with the fleet transition timeline ensures that a qualified workforce is ready and available to support a successful deployment.

Workforce development is an ongoing process that must continue as fleets scale up and deploy additional zero-emission vehicles. To ensure that the workforce scales efficiently and cost-effectively, STA will employ training strategies that support additional zero-emission vehicle deployments in the future.

Section 17 - Conclusions and Recommendations

ZEB technologies are in a period of rapid development and change. BEBs will require significant investment in facilities and infrastructure and may require changes to service and operations to manage their inherent constraints. On the other hand, FCEBs are believed to provide an approximate operational equivalent to diesel or CNG, however, the current incremental cost of buses, fueling infrastructure, and fuel places this technology at a disadvantage.

STA has committed to a minimum fleet of 40 BEBs by the end of 2023. Charging requirements for these BEBs will utilize all of the existing electrical capacity at the Northwest Boone Garage. As a result, other alternatives including building out a new storage and maintenance facility to allow for further BEB charging or hydrogen fueling were considered as part of this evaluation, though the cost of the land and construction of the facility were not considered in the evaluation. Based on this evaluation, STA may be able to reach a 95% BEB fleet by 2045; however; to reach a 100% ZEB fleet, other alternatives such as on-route charging or the purchase of FCEBs would need to be implemented. In a mixed fleet scenario of depot charged BEBs and FCEBs, FCEB costs are adversely impacted by the currently high FCEB capital costs. The cost of an FCEB is approximately two times that of a comparable diesel vehicle and hydrogen costs are currently estimated at $9/kg. Hydrogen costs would need to be reduced to less than approximately $5/kg to be comparable to current diesel costs. The availability of green hydrogen is expected to increase significantly in the future as a result of federal, state, and private investment in production. As a result, the cost per kilogram may be significantly reduced in the future. These developments would positively impact the viability of incorporating FCEBs into the fleet.

Recommendations for STA are as follows:

1. **Complete evaluation of FCEB Pilot or Initial Deployment:** Evaluate the availability and cost of completing an initial deployment or pilot of FCEBs utilizing mobile hydrogen fueling. The plan, if endorsed by STA, could be used to request federal funding through a competitive grant program (Low No or Buses and Bus Facilities) to fund the deployment.
2. **Complete Facility Master Plan:** STA is currently preparing a facility master plan to determine future facility needs, including evaluation of locations for a second storage and maintenance facility that could be used to support expansion of the ZEB fleet.
3. **Consider design/build/operate agreements with hydrogen suppliers for build out of hydrogen fueling.** If utilization of hydrogen FCEBs is selected in the future, then consider agreements with a qualified firm to design, build, and operate (DBO) the hydrogen supply and fueling infrastructure. This typically requires an agreement to purchase fuel from the supplier at a set rate per kilogram of fuel delivered or dispensed. These agreements ensure consistent operation of the fueling equipment and supply.

The transition to ZEB technologies represents a paradigm shift in bus procurement, operation, maintenance, and infrastructure. The technology requires significant development before it is ready to support fleetwide transitions. However, 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. Ultimately, the ZEB technology that is most efficient and sustainable to operate will evolve into either the majority ZEB solution or the only ZEB solution.

Section 18 – References

Annual Energy Outlook 2022: March 3, 2022, Independent Statics and Analysis, U.S. Energy Information Administration, https://www.eia.gov/outlooks/aeo/, 2022

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Foothill Transit Battery Electric Bus Demonstration Results: Second Report, National Renewable Energy Laboratory, https://www.nrel.gov/docs/fy17osti/67698.pdf, 2017

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"Washington State Implements Major Programs to Reach Climate Goals", https://www.perkinscoie.com/en/news-insights/washington-state-implements-major-programs-to-reach-climate-goals.html#:~:text=It%20provides%20that%2C%20by%202050,to%2095%25%20below%201990%20levels.pdf, Perkins Coie LLP, February 2, 2022.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 5A: CONNECT SPOKANE COMPREHENSIVE PLAN UPDATE: DRAFT ELEMENTS REVIEW

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Mike Tresidder, Senior Transit Planner

SUMMARY: Staff reviewed drafts of the Revenues and Fares and Transit Equity and Inclusion elements and received feedback from Committee members at the May Planning & Development Committee meeting. Staff will present minor updates to several other elements at today's committee meeting. In addition, staff will present on the proposed outreach approach and schedule leading into Fall 2024.

BACKGROUND: Connect Spokane is STA's comprehensive plan and sets forth a planning vision and policy framework to help guide decisions made by the Board of Directors, staff, and partnering agencies for at least the next 30 years. The existing plan can be viewed here:

https://www.spokanetransit.com/projects/comprehensive-plan/

The Connect Spokane Phase 2 Update was initiated in July 2023 consistent with the Planning & Development Committee's 2023 Work Program. A more detailed scope of work for the plan update was presented in September 2023 and identified several elements requiring a more substantial review and possible update. The May 2024 review of the Revenues and Fares Element, as well as the proposed Equity and Inclusion Element, represent the most significant changes under consideration. As was discussed during the committee meeting, several policies will be brought forward to the full Board for input. This is scheduled to take place June 20, 2024.

For the June committee meeting, minor updates to the following elements will be brought forward for discussion: High Performance Transit (HPT), Fixed Route, Paratransit, Flexible Services, Communications and Public Input, Regional Transportation & Land Use, and Sustainability, as described in the table below.

Element	Overview of Updates
High Performance Transit	Updated table and map of High Performance Transit (HPT) routes. Informed by *Connect 2035* Network evaluation.

Element	Overview of Updates
Fixed Route	Evaluate policy benchmark for geographic extent, considering needs for service beyond the current limits of the transit network.
Paratransit	Service Area definition (no change to boundary).
Flexible Services	Update with new shared mobility language, and distinction STA has between Shared Mobility/Mobility Hubs/Mobility on Demand. Includes criteria for identification of mobility on demand project.
Communications and Public Input	Recognize public participation spectrum, update outreach tools to reflect current best practices. Consider potential policy related to partner coordination.
Regional Transportation, Land Use, and Economic Development ~~& Land Use~~	Update element title, update Transit-Oriented Development (TOD) and land acquisition policies. Incorporate economic development in element language.
Sustainability	Minor updates to chapter language, minor re-organization.

Staff will also be presenting on the proposed outreach approach and schedule leading to plan adoption in Fall 2024.

RECOMMENDATION TO COMMITTEE: Receive report.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 5B : CONNECT 2035 STRATEGIC PLAN: WORKSHOP PREVIEW

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Mike Tresidder, Senior Transit Planner

SUMMARY: The Planning & Development Committee has a key role in navigating the development of STA's next ten-year strategic plan, known as *Connect 2035*. Staff will review recent and upcoming activities associated with Phase 2 of *Connect 2035* Strategic Plan. In addition, staff will review the Board Workshop scheduled for June 5, 2024.

BACKGROUND: The most recent Connect 2035 Board Workshop was held with the STA Board of Directors on March 6, 2024. The key outcomes from that workshop were:

- The establishment, by resolution 818-24, of funding and investment principles for the development of *Connect 2035*
- The identification of two action pathways for planned and potential improvements related to the Fixed Route Network Assessment completed as part of the strategic planning effort
- Concurrence on the framework for developing candidate *Connect 2035* initiatives for evaluation

Since that workshop, staff have provided information to the Committee on proposed plan outcomes to be used to gauge impact on riders and reviewed the initiative development and evaluation framework to be used. Staff are preparing to engage the Board in a workshop scheduled after the Committee meeting for Wednesday June 5, 2024. This workshop has several objectives:

- Recap past Board efforts on *Connect 2035*
- Provide an update on community engagement efforts
- Review candidate initiatives, gather Board feedback, and identify any gaps in identified initiatives
- Build understanding of next steps in initiative evaluation, refinement, and packaging process

Staff have also conducted numerous engagement events and activities to gather feedback from transit riders, community-based organizations (CBOs), business organizations, employers, STA Board members, employees, planning commissions, and the general public. Like past committee meetings, staff will briefly review recent engagement activities and their role in informing the list of candidate *Connect 2035* initiatives. Overall, the project is on schedule to have the final *Connect 2035* plan ready for Board adoption in December 2024.

RECOMMENDATION TO COMMITTEE: Receive report.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 5C: 2025-2030 TRANSIT DEVELOPMENT PLAN: COMPLETE DRAFT (PUBLIC HEARING)

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Madeline Arredondo, Associate Transit Planner

SUMMARY: The Transit Development Plan (TDP) is a state-required plan that STA prepares annually to convey how we intend to implement public transportation services and related capital and operating projects over a six-year period. Staff will give an overview of the draft 2025-2030 TDP in anticipation of public input during the month of June with the intent to seek Board approval of the final TDP in July 2024.

BACKGROUND: Over the past several months, the Planning & Development (P&D) Committee has been involved in providing input and reviewing content for the 2025-2030 TDP. The draft plan is available online on the following web page:

https://www.spokanetransit.com/projects/transit-development-plan/

State law stipulates transit agencies must prepare a transit development plan, hold a public hearing prior to adoption, and submit the plan to the Washington State Department of Transportation (WSDOT), no later than September 1 of each year. The 2025-2030 Transit Development Plan is in draft form. A public hearing will be held at the Board of Director's meeting on June 20, 2024. Subject to Board direction, staff anticipate preparing a final draft of the plan for Board approval on July 25, 2024.

The table below outlines the major sections of the plan and notes the method for preparing each section, including committee guidance and participation.

TDP Update Summary	
TDP Sections	**P&D Committee Actions/Notes**
1. Introduction and Overview	Background, Agency Leadership, Board of Directors, Service Characteristics, and Service Area updated from last year and included in the draft TDP.
2. 2023 in Review	Ridership, Fleet Additions, Capital Projects, Communications, Business and Program Development, and Planning Efforts updated and included in the draft TDP.
3. Mid-Range Tactical Framework, State Policy Goals	Reviewed and discussed by the Planning & Development Committee in March and April 2024. Updates are included in the draft TDP.
4. Service Improvement Program	A review of major service improvements and opportunities was presented to the Planning & Development Committee in May 2024. Updates are included in the draft TDP.

TDP Update Summary	
TDP Sections	**P&D Committee Actions/Notes**
5. Capital Improvement Program	Updates will be provided in the draft TDP and reviewed during the June 5, 2024, Planning & Development Committee meeting.
6. Operating and Financial Projections	Key assumptions reviewed and affirmed at the May 1, 2024, Planning & Development Committee meeting. Projections reflect key assumptions, the proposed capital, and operating plans. Updates will be provided in the draft TDP.
Appendix A: 2023 Action Plan	The STA Board of Directors adopted the 2024 Budget that includes the Annual Action Plan in December 2023. Included in the draft TDP.
Appendices B-F	Appendices include: 2024 Performance Measures, System Ridership, Miles, and Hours Statistics, 2023 Fuel Consumption, 2023 Reportable Collisions, Injuries, and Fatalities, Bus Fleet Contingency Plan. Included in the draft TDP.
Appendix G: Transit Asset Management (TAM) Plan	The plan was drafted in February 2024 and is incorporated in the draft TDP by reference. The full plan can be viewed here: https://www.spokanetransit.com/projects/transit-asset-management-plan/

STA developed an expanded stakeholder outreach approach beyond the required public hearing to promote more involvement in the development of the plan and was presented to the Planning & Development Committee in March 2024. The expanded outreach includes presentations to STA's Citizen Advisory Committee (CAC), SRTC's Transportation Technical Committee (TTC) and Transportation Advisory Committee (TAC), Washington State Department of Transportation (WSDOT) Eastern Region, as well as in-person and virtual public meetings. Below is a summary of the remaining public outreach schedule to present the draft TDP and provide notice of the upcoming public hearing:

Remaining Public Outreach Schedule	
Date	**Stakeholders**
June 4, 2024	Washington State Department of Transportation (WSDOT) Eastern Region
June 6, 2024	Virtual public meeting
June 10, 2024	In-person public meeting
June 12, 2024	Citizen Advisory Committee (CAC)
June 13, 2024	SRTC Board of Director's meeting

RECOMMENDATION TO COMMITTEE: Receive report.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 5D:	I-90/VALLEY HIGH PERFORMANCE TRANSIT CORRIDOR DEVELOPMENT PLAN: ROUTE 7 SUPPLEMENTAL
REFERRAL COMMITTEE:	n/a
SUBMITTED BY:	Karl Otterstrom, Chief Planning & Development Officer Lukas Yanni, Associate Transit Planner

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SUMMARY: The I-90/Valley High Performance Transit (HPT) Route 7 is planned to supersede Routes 60 and 74 as one singular route that extends from Spokane International Airport to Liberty Lake. Staff will present planning efforts associated with this investment and a draft supplemental plan to the I-90/ Valley HPT Corridor Development Plan (CDP).

BACKGROUND: Spokane Transit is nearing the completion of its efforts to deliver *STA Moving Forward* and the many multifaceted projects that include new services and infrastructure to provide residents with expanded regional mobility choices. In October 2022, the STA Board of Directors approved the I-90/Valley HPT Corridor Development Plan (CDP) as the culmination of a planning effort to further define the investments, both planned and prospective, to support regional mobility along Interstate 90. Investments such as Mirabeau Transit Center and Argonne Station Park & Ride were identified investments in the CDP. The CDP also identified Route 7 as the primary investment in all-day, two-way service as part of delivering *STA Moving Forward.*

Staff have prepared a draft supplemental report to accompany the CDP that addresses the routing and investment plan for future Route 7, which is scheduled to replace Route 60 Airport and 74 Liberty Lake via Mirabeau Park & Ride in September 2025. The draft supplemental report and other corridor documents can be viewed online: https://www.spokanetransit.com/i90

The draft supplemental report includes the following elements:

- Making Spokane International Airport, rather than West Plains Transit Center, the western terminus of Route 7
- Adhere to the routing between downtown Spokane and Spokane International Airport that will be used on Route 60 Airport effective September 2024, including service on Flint Road
- Identifying stop locations that will receive enhanced HPT investments, including HPT markers with digital signage, and shelters, as well as stops to be closed or consolidated
- Plans for future integration with Argonne Station Park & Ride

Public engagement for the supplemental report development has included four open houses held in March and April 2024 in connection with *Connect 2035* and other transportation projects. STA will be disseminating information on the draft report to obtain feedback from customers and partner jurisdictions commensurate with the modest changes the supplemental plans include compared with the original CDP. Staff intend to bring forward the final Route 7 Supplemental Report in July for Committee and Board approval to support design and implementation efforts.

RECOMMENDATION TO COMMITTEE: Receive report.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 5E : TRANSIT-ORIENTED DEVELOPMENT: PILOT PROJECT PLAN

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer
Brian Jennings, Deputy Director for Community Development

SUMMARY: Staff will present a proposed framework for advancing Transit-Oriented Development (TOD) within STA's Public Transportation Benefit Area (PTBA), implementing Near-Term Investment Project D-04: Launch Transit-Oriented Development Partnership.

BACKGROUND: In December 2021, the STA Board adopted resolution 790-21, identifying potential Near-Term Investment Project #D-04 that would advance up to two pilot TOD opportunities in connection to existing transit facilities. The resolution programmed up to $2 million for the project. In response to the resolution, staff have developed a framework for promoting and incentivizing TOD development in jurisdictions within the PTBA. As presented below, we propose to consider a more strategic approach to TOD investments that can provide equal access to STA's TOD resources to jurisdictions across the PTBA, including the cities of Airway Heights, Cheney, Liberty Lake, Medical Lake, Millwood, Spokane and Spokane Valley, and unincorporated areas of Spokane County within Spokane Transit's PTBA.

PTBA Jurisdictions - $1 Million Allocated

The proposed framework has three components:

1) **Identify and prioritize** current or future station locations in the PTBA with the greatest potential for TOD and opportunities for physical improvements via capital investment. This initial study would be conducted by STA.
2) **Small scale technical assistance grants** via a competitive Request for Proposals (RFP) process open to all jurisdictions in the PTBA. The funding will assist with planning, design, or preliminary engineering work that moves infrastructure projects closer to implementation.
3) **Station-Area planning grants** -Issue RFP for larger station-area planning grants that develop and deliver new land-use and sub-area plans intended for implementing TOD in concert with planned transit investments.

STA Properties - $1 Million Allocated

1) **Identify and prioritize** – STA-owned facilities will also be considered and evaluated as part of this process.
2) **STA-owned properties** – Use funds for strategic land acquisitions, preliminary site-planning / programming, or feasibility analysis for redevelopment opportunities.

Initial analysis and development by staff will begin in 2024 with the initial study identified in the proposed framework. Review of the findings, public outreach, and gathering local input on the priority list of locations would follow in the winter. After further refinement based on public input, a final list of identified locations would be brought forward to the Board for official adoption as TOD areas of emphasis within the PTBA.

RECOMMENDATION TO COMMITTEE: Receive report.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 6: CEO REPORT - INFORMATION

REFERRAL COMMITTEE: n/a

SUBMITTED BY: E. Susan Meyer, Chief Executive Officer

SUMMARY: At this time, the CEO will have an opportunity to comment on various topics of interest regarding Spokane Transit.

RECOMMENDATION TO COMMITTEE: For discussion.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 7A:	DIVISION STREET BUS RAPID TRANSIT: DESIGN AND PUBLIC OUTREACH UPDATE
REFERRAL COMMITTEE:	n/a
SUBMITTED BY:	Karl Otterstrom, Chief Planning & Development Officer Don Skillingstad, Senior Project Manager

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SUMMARY: Division Street Bus Rapid Transit (BRT) is currently in the project development phase. The following report summarizes current activities for this important regional project.

BACKGROUND: Division Street Bus Rapid Transit (BRT) is envisioned to be the second BRT line in the Spokane region, extending from downtown Spokane along the Division Street Corridor for approximately ten miles to the Mead area. The project is identified in the region's Metropolitan Transportation Plan and has garnered state legislative support as a complementary investment to the North Spokane Corridor.

On September 19, 2023, the Federal Transit Administration (FTA) approved STA's request to enter the Project Development phase of the Capital Investment Grant (CIG) program. On October 19, 2023, the Board approved a work order with Parametrix, Inc. to advance the project to the 30% design milestone, along with other necessary Project Development activities. Below is an update on recent project activities and outreach efforts.

Project Management

- Completed baseline master project schedule
- Updated Executive Management Team on Generation-2 amenities design options
- Quarterly grant report completed to FTA
- Risk register updated
- Regular meetings with the consultant team, internal STA project management and communications teams, Technical Advisory Committee, internal Executive Management Team

Agency Coordination

- Confirmed design and documentation requirements with WSDOT engineering staff
- Obtained concurrence on design plan submittal schedule with technical leads at all partner agencies

Planning and Analysis

- Completed draft parking study
- Draft north transit center and downtown charging/layover location siting evaluation completed
- Station cut sheets (information sheets) completed
- Completed initial service operations and fleet analysis

Design and Engineering

- Technical Advisory Committee removed Guinevere Road and Queen Avenue stations from project, confirmed by station location online survey
- Completed corridor lighting study and geotechnical boring plan
- Second utility coordination letter sent to utility providers
- Received City of Spokane comments on conceptual plans
- Corridor surveying and base mapping completed

Traffic Analysis and Modeling

- Design team attended SRTC traffic demand model training and are reviewing/validating data
- Held workshop with all agencies to confirm the traffic analysis methods and assumptions; as of late May 2024, working with agencies to obtain written concurrence on the model approach

Environmental Review

- Preliminary environmental review documents complete
- Cultural resources/Section 106 scope of work confirmed
- Area of Potential Effects (APE) draft map completed and being readied for FTA confirmation

FTA and Grant Support

- Held second quarterly meeting with FTA team to provide update on the project
- Attended FTA CIG Policy Guidance changes workshop and are developing comments
- Attended FTA CIG Roundtable workshop

Outreach Activities

- Attended STA transportation open houses
- Updated project website
- Social media posts
- Continued development of a 3D model of the Division Street corridor
- Continued development of street profile renderings
- Continued development of the Ruby Street alternatives renderings
- Continued development of the online interactive map

<u>RECOMMENDATION TO COMMITTEE</u>: Information only.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 8: JULY 12, 2024, COMMITTEE MEETING DRAFT AGENDA REVIEW

REFERRAL COMMITTEE: n/a

SUBMITTED BY: Karl Otterstrom, Chief Planning & Development Officer

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SUMMARY: At this time, members of the Planning & Development Committee will have an opportunity to review and discuss the items proposed to be included on the agenda for the meeting of July 12, 2024.

RECOMMENDATION TO COMMITTEE: For discussion.

Spokane Transit Authority
1230 West Boone Avenue
Spokane, WA 99201-2686
(509) 325-6000

PLANNING & DEVELOPMENT COMMITTEE MEETING

Wednesday, July 10, 2024
10:00 a.m. – 11:30 a.m.

STA Northside Conference Room
Spokane Transit Authority
1230 W. Boone Avenue, Spokane, WA
w/Virtual Public Viewing Option Link Below

DRAFT AGENDA

1. Call to Order and Roll Call
2. Committee Chair Report *(5 minutes)*
3. Committee Action *(5 minutes)*
   A. Minutes of the June 5, 2024, Committee Meeting -- *Corrections/Approval*
4. Committee Action
   A. Board Consent Agenda *(10 minutes)*
      1. I-90 / Valley High Performance Transit Corridor Development Plan: Route 7 Supplemental Report Approval *(Otterstrom)*
   B. Board Discussion Agenda *(10 minutes)*
      1. 2025-2030 Transit Development Plan: Finalize and Approve (Resolution) *(Otterstrom)*
5. Reports to Committee *(30 minutes)*
   A. Federal Transit Administration Section 5310: Call For Projects *(Otterstrom)*
   B. Connect Spokane Comprehensive Plan: Review Draft Elements *(Otterstrom)*
6. CEO Report *(E. Susan Meyer) (15 minutes)*
7. Committee Information
8. Review September 4, 2024, Committee Meeting Draft Agenda *(No August meeting)*
9. New Business
10. Committee Members' Expressions *(5 minutes)*
11. Adjourn

Next Committee Meeting: Wednesday, September 4, 2024, at 10:00 a.m. in person.

Virtual Link:	Join **here**		
Password:	**Members**: 2024	|	**Guests**: Guest
Call-in Number:	1-408-418-9388	|	Event #: XXXX XXX XXXX

Agendas of regular Committee and Board meetings are posted the Friday afternoon preceding each meeting at the STA's website: www.spokanetransit.com. Discussions concerning matters to be brought to the Board are held in Committee meetings. The public is welcome to attend and participate. Spokane Transit assures nondiscrimination in accordance with Title VI of the Civil Rights Act of 1964 and the Americans with Disabilities Act. For more information, see www.spokanetransit.com. Upon request, alternative formats of this information will be produced for people who are disabled. The meeting facility is accessible for people using wheelchairs. For other accommodations, please call (509) 325-6094 (TTY Relay 711) at least forty-eight (48) hours in advance.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM 9: NEW BUSINESS

REFERRAL COMMITTEE: n/a

SUBMITTED BY: n/a

SUMMARY: At this time, the Committee will have the opportunity to initiate discussion regarding new business relating to Planning & Development.

RECOMMENDATION TO COMMITTEE: For Discussion.

SPOKANE TRANSIT AUTHORITY

PLANNING & DEVELOPMENT COMMITTEE MEETING

June 5, 2024

AGENDA ITEM __10__: COMMITTEE MEMBERS' EXPRESSIONS

REFERRAL COMMITTEE: n/a

SUBMITTED BY: n/a

SUMMARY: At this time, members of the Planning & Development Committee will have an opportunity to express comments or opinions.

RECOMMENDATION TO COMMITTEE: n/a