



**COMMISSION
AGENDA MEMORANDUM**

Item No. 8f

ACTION ITEM

Date of Meeting June 27, 2023

DATE: June 16, 2023

TO: Stephen P. Metruck, Executive Director

FROM: Keri Stephens, Director, Aviation Facilities and Capital Programs
Eileen Francisco, Director, Aviation Project Management

SUBJECT: Variable Frequency Drives (VFD) Replacement Phase 2 (CIP #C800978)-Design Authorization

Amount of this request: \$2,500,000

Total estimated project cost: \$10,500,000

ACTION REQUESTED

Request Commission authorization for the Executive Director to (1) prepare design and construction bid documents for the Variable Frequency Drives (VFD) Replacement Phase 2 project; (2) utilize Port of Seattle crews to support design and pre-construction activities. The amount of this request is \$2,500,000, for a total estimated project cost not-to-exceed \$10,500,000.

EXECUTIVE SUMMARY

Variable Frequency Drives (VFDs) are a motor control device that, for this application, modulate HVAC fans, pumps, etc. allowing for better occupancy comfort. The VFD Phase 2 project has identified 70 critical condition VFDs across the airport facilities that need to be replaced as an urgent priority since they are beyond their useful lives and prone to failure. These are old and obsolete VFDs with no replacement parts available and no longer supported by the manufacturer. Failure of a VFD will cause the HVAC or plumbing systems to become non-operational, resulting in loss of proper ventilation, air flow, temperature, water flow, an increase in energy consumption, and poor passenger comfort.

JUSTIFICATION

The recently completed project scoping document and condition study found 70 VFDs in critical condition and in need of immediate replacement. This represents a substantial increase in project scope and budget over the original Status 2 document which assumed 47 VFD would need to be replaced. The VFD Phase 2, Status 2 document was scoped and budgeted based on the VFD Phase 1 project. The VFD Phase 1 project replaced 47 VFDs at a cost of \$4.3M. The original Status 2 scoping document was preliminary in nature and not based on field investigations or asset

Meeting Date: June 27, 2023

condition. Increase in the number of VFDs, cost escalation, and inflation have resulted in an increase to the budget estimate which is now \$10.5M. Airport leadership approved the revised project scope from 47 to 70 VFDs in Q1, 2023.

Sporadic VFD failures have occurred in the past and since replacement parts are no longer provided by the manufacturer, shops need to search for parts to keep VFDs operational. Repair parts will be salvaged from the replaced VFDs and added to the Port’s spare parts inventory. Preventing VFD failure will avoid manual HVAC control that leads to poor passenger comfort and increased energy consumption. VFD failure can also lead to security issues if building pressurization affects door operation. The new VFDs will save electricity and natural gas by modulating motor speeds to meet the real-time demands.

Diversity in Contracting

The design services will be completed using an existing IDIQ contract (Casne Engineering – P00320720) that was established in 2022 which has a 16% WMBE participation utilization requirement.

DETAILS

The new scope of work for 70 VFDs also includes six 300 HP VFDs and two pump lift station fuel farm VFDs which result in increased costs. The table below provides a breakdown of the requested increase in the budget.

Description	Original Budget (Status 2)	New Budget	Total Change
Estimated Construction Cost / Change Order NTE Amount	\$2,703,000	\$6,277,000	\$3,574,000
Sales Tax	\$270,000	\$628,000	\$358,000
Other Costs (i.e., Soft Costs)	\$1,327,000	\$3,595,000	\$2,268,000
Total Estimated Cost	\$4,300,000	\$10,500,000	\$6,200,000

Scope of Work

The project will be replacing 70 critical VFDs that are beyond their useful lives and are subject to failure. These VFDs are located at multiple locations at the SEA such as parking garage, fuel farms, concourses B, C, D, NSAT, SSAT, and main terminal.

The key elements of project’s scope of work include, but are not limited to, the following:

- (1) Identification and replacement of VFDs depending on the design criteria, schedule and phasing plan, and useful lives.
- (2) Connection to Port’s Building Automation System (BAS).
- (3) Provide wiring, testing, commissioning, and associated equipment for a fully functional system.

Meeting Date: June 27, 2023

- (4) Salvage components from these existing VFDs and add those to Port’s spare parts inventory for use in other obsolete VFDs.

Schedule

Activity

Design start	2023 Quarter 3
Commission construction authorization	2024 Quarter 3
Construction start	2025 Quarter 1
In-use date	2026 Quarter 2

Cost Breakdown

	This Request	Total Project
Design	\$2,500,000	\$2,615,000
Construction	0	\$7,885,000
Total	\$2,500,000	\$10,500,000

ALTERNATIVES AND IMPLICATIONS CONSIDERED

Alternative 1 – Status Quo. Do not proceed with the project.

Cost Implications: Expenses incurred for notebook development - \$60,000.

Pros:

- (1) Capital investment won’t be required.

Cons:

- (1) Obsolete VFDs are no longer supported by the manufacturer.
- (2) In case of a failure, the VFD will have to be controlled manually, resulting in poor passenger comfort and increased energy consumption.
- (3) Inventory for spare parts will be depleted.

This is not the recommended alternative.

Alternative 2 – Reduce the number of VFDs to be replaced and maintain status 2 authorized budget.

Cost Implications: Capital investment of \$4,300,000.

Pros:

- (1) Lower capital cost due to reduction in scope of work.

Cons:

- (1) The cost per VFD will be higher.
- (2) This approach still leaves SEA vulnerable to VFD failures that may cause HVAC outages.
- (3) This approach doesn’t provide a planned and sustainable asset management schedule.
- (4) The availability of spare parts will be lower.

This is not the recommended alternative.

Meeting Date: June 27, 2023

Alternative 3 – Replace all of the proposed 70 VFDs.

Cost Implications: Capital investment of \$10,500,000.

Pros:

- (1) The cost per VFD will be lower.
- (2) The risk of VFD failure leading to system outages will be significantly lower.
- (3) The availability of spare parts will be higher.

Cons:

- (1) High capital cost.

This is the recommended alternative.

FINANCIAL IMPLICATIONS

<i>Cost Estimate/Authorization Summary</i>	Capital	Expense	Total
COST ESTIMATE			
Original estimate (Status 2)	\$4,300,000	\$0	\$4,300,000
Current change	\$6,200,000	\$0	\$6,200,000
Revised estimate	\$10,500,000	\$0	\$10,500,000
AUTHORIZATION			
Previous authorizations	\$115,000	0	\$115,000
Current request for authorization	\$2,500,000	0	\$2,500,000
Total authorizations, including this request	\$2,615,000	0	\$2,615,000
Remaining amount to be authorized	\$7,885,000	0	\$7,885,000

Annual Budget Status and Source of Funds

Variable Frequency Drives (VFD) Replacement Phase 2 (CIP #C800978) is included in the 2023-2027 capital budget and plan of finance with a budget of \$4,300,000. The capital increase of \$6,200,00 was transferred from the Aeronautical Allowance¹ CIP C800753 resulting in no net change to the Airport capital budget. The funding sources will be the Airport Development Fund and future revenue bonds.

Financial Analysis and Summary

Project cost for analysis	\$10,500,000
Business Unit (BU)	Terminal Building
Effect on business performance (NOI after depreciation)	NOI after depreciation will increase due to inclusion of capital (and operating) costs in airline rate base.
IRR/NPV (if relevant)	N/A

¹ The Aeronautical Allowance is included in the Capital Improvement Plan to ensure funding capacity for unspecified projects, cost increases for existing projects, new initiatives, and unforeseen needs. This ensures funding capacity for unanticipated spending within the dollar amount of the Allowance CIP.

Meeting Date: June 27, 2023

CPE Impact	\$0.03 in 2027
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Future Revenues and Expenses (Total cost of ownership)

The scope of the project is to replace existing equipment which is beyond useful life and not to introduce any additional assets. Replacement of the equipment will require a similar level of maintenance; therefore, AVM anticipates it will not have a material impact on O&M costs. The new VFDs will result in energy efficiency and reduction in greenhouse gas emissions as compared to the older technology VFDs. The calculations to determine the exact percentages will be performed during the design phase.

ADDITIONAL BACKGROUND

47 VFDs were replaced in Phase 1 of this project which was completed in 2020. In addition to these 70 VFDs proposed in Phase 2, there are an additional 140 VFDs slated for replacement in Phase 3 and Phase 4.

ATTACHMENTS TO THIS REQUEST

- (1) Presentation slides

PREVIOUS COMMISSION ACTIONS OR BRIEFINGS

N/A