



**COMMISSION  
AGENDA MEMORANDUM**

**Item No.** 6c

**ACTION ITEM**

**Date of Meeting** September 25, 2018

**DATE:** September 17, 2018

**TO:** Stephen P. Metruck, Executive Director

**FROM:** Jeffrey Brown, Director Aviation Facilities and Capital Programs  
Wayne Grotheer, Director Aviation Project Management

**SUBJECT:** Variable Frequency Drive Renewal and Replacement (CIP #C800801)

**Amount of this request:** \$1,970,000

**Total estimated project cost:** \$3,995,000

**ACTION REQUESTED**

Request Commission authorization for the Executive Director to (1) advertise and award a construction contract for the Variable Frequency Drive Renewal and Replacement project at Seattle-Tacoma International Airport; and (2) utilize Port of Seattle crews and small works contracts for preliminary work if required. The amount of this request is \$1,970,000 for a total estimated project cost not to exceed \$3,995,000.

**EXECUTIVE SUMMARY**

Commission previously authorized \$2,025,000 for design in May 2017. This additional authorization of \$1,970,000, for a total project authorization of \$3,995,000, will provide the necessary funding to complete this project that will replace 47 of the oldest and outdated Variable Frequency Drives (VFDs) installed at Seattle Tacoma International Airport. This project represents the first phase of a program to replace approximately 131 VFDs that are reaching the end of their useful life. VFDs control critical Heating, Ventilation and Air-conditioning (HVAC) systems throughout the airport, including air handling supply fans in the terminal buildings and pumps in the cooling towers. The new VFDs are more energy efficient and will also result in reduced greenhouse gas emissions. The estimated project cost of \$3,995,000 represents a budget savings of \$2,839,000 or 41%, over prior estimate.

**JUSTIFICATION**

The VFDs have an American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) recommended useful life of ten to fifteen years and all 47 of these drives have been in operation for more than 15 years. Several have been in operation for more than 21 years. The manufacturer no longer supports these older VFDs, and failures have occurred depleting repair parts from maintenance inventory. If this project is not completed additional failures of

Meeting Date: September 25, 2018

these 47 VFDs could result in extended outages of HVAC systems in the terminal buildings that would affect tenants, travelers, and employee comfort.

**DETAILS**

The 47 VFDs this project will replace are located throughout the airport terminal buildings. The new VFDs will be connected to the airport’s Direct Digital Control (DDC) system for energy consumption and performance monitoring. These new VFDs will reduce energy consumption by approximately 58,000 kilowatt hours per year (KWH/year) and reduce greenhouse gas emissions by 1.1 metric tons per year as compared to the older technology VFDs. Success for this project will be achieved when all 47 of these VFDs are replaced, fully commissioned and connected to the DDC system.

***Scope of Work***

The scope of work for this project includes:

- Replace 47 existing VFDs that have exceeded their useful life.
- Connect new VFDs to the existing DDC system.
- Provide wiring, testing, commissioning and associated equipment for a fully functional system.
- Salvage components from these 47 VFDs and add those components to the Port’s spare parts inventory.

**Small Business**

To maximize small business and Woman, Minority Business Enterprise (WMBE) participation, Port staff has provided additional outreach efforts through the Port of Seattle’s Small Business Generator (PortGen) program. The PortGen program provided information about the project scope of work, and training about the Port’s procurement processes. Working with Economic Development Division’s Small Business Development Department (SBDD), the Port will establish small business goals and requirements for the project. Additional time will be allocated for prime contractors to meet with potential MWBE firms as part of the pre-bid meeting agenda.

***Schedule***

*Activity*

Construction start	1 <sup>st</sup> Quarter 2019
Final In-use date	4 <sup>th</sup> Quarter 2020

***Cost Breakdown***

	This Request	Total Project
Design and Soft Costs	\$0	\$1,175,000
Construction	\$1,970,000	\$2,820,000
Total	\$0	\$3,995,000

Meeting Date: September 25, 2018

**ALTERNATIVES AND IMPLICATIONS CONSIDERED**

**Alternative 1**– Do not replace these VFDs.

Cost Estimate: An estimated \$325,000 in costs to date would need to be expensed if this project is canceled.

Pros:

- (1) No additional investment required

Cons:

- (1) VFDs have an ASHRAE recommended useful life of ten (10) to fifteen (15) years. All 47 of these VFDs have between 15-21 years of use and are considered obsolete.
- (2) Increases likelihood of extended HVAC system outages affecting tenants, travelers, and employee comfort due to these VFDs having exceeded their recommended useful life.
- (3) Manufacturers no longer provide repair parts for VFDs manufactured 15-20 years ago and the Port's spare parts inventories have been depleted.
- (4) Does not provide energy and performance monitoring through connection to the DDC system.
- (5) Does not provide energy savings or reduction in related greenhouse gas emissions.

This is not the recommended alternative.

**Alternative 2** – Replace 131 VFDs that have exceeded the ASHRAE recommended useful life.

Cost Estimate: \$11.135 million

Pros:

- (1) Reduces the likelihood of extended HVAC system outage due to these VFDs failing.
- (2) Provides energy and performance monitoring through connection to the DDC system.
- (3) Efficient VFDs will reduce energy usage and related Greenhouse gas emissions.

Cons:

- (1) Significant capital investment required.

This is not the recommended alternative.

**Alternative 3** – Replace the 47 oldest VFDs that have exceeded the ASHRAE recommended useful life.

Cost Estimate: \$3.995 million

Pros:

- (1) Reduces the likelihood of extended HVAC system outage due to these VFDs failing.
- (2) Provides energy and performance monitoring through connection to the DDC system.
- (3) Components from these 47 VFDs will be salvaged and added to the Port's spare parts inventory in support of the remaining end of useful life obsolete VFDs.
- (4) Efficient VFDs will reduce energy usage and related greenhouse gas emissions.

Meeting Date: September 25, 2018

Cons:

- (1) Requires capital investment.
- (2) Does not replace 84 remaining end-of-life VFDs.

***This is the recommended alternative.***

**FINANCIAL IMPLICATIONS**

***Cost Estimate/Authorization Summary***

	Capital	Expense	Total
<b>COST ESTIMATE</b>			
Prior estimate	\$6,834,000	\$0	\$6,834,000
Changes from prior estimate	-\$2,839,000	\$0	-\$2,839,000
Revised estimate	\$3,995,000	\$0	\$3,995,000
<b>AUTHORIZATION</b>			
Previous authorizations	\$2,025,000	\$0	\$2,025,000
Current request for authorization	\$1,970,000	\$0	\$1,970,000
Total authorizations, including this request	\$3,995,000	\$0	\$3,995,000
Remaining amount to be authorized	\$0	\$0	\$0

***Annual Budget Status and Source of Funds***

This project (CIP #C800801) was included in the 2018 – 2022 capital budget and plan of finance with a budget of \$6,834,000. The budget savings of \$2,839,000 will be transferred to the Aeronautical Allowance CIP (C800753), resulting in no net change to the airport capital budget. As the project progressed the design costs were negotiated and reduced. The per-unit cost of the 47 VFD’s was originally estimated at a high unit cost because the specific VFD to be replaced had not been identified. We now have a detailed design and have identified the exact 47 VFD’s that will be replaced and have the per-unit cost of each VFD which significantly reduced the cost estimate.

The funding source for this project will be the 2018A revenue bonds and future revenue bonds.

***Financial Analysis and Summary***

Project cost for analysis	\$3,995,000
Business Unit (BU)	Terminal Building
Effect on business performance (NOI after depreciation)	NOI after depreciation will increase
IRR/NPV (if relevant)	N/A
CPE Impact	\$0.01 in 2021

Meeting Date: September 25, 2018

***Future Revenues and Expenses (Total cost of ownership)***

This project replaces existing equipment that is obsolete. Replacement of the equipment will require a similar level of maintenance (or slightly less) and does not have a material impact on current Aviation Maintenance O&M costs.

**ATTACHMENTS TO THIS REQUEST**

- (1) Presentation slides

**PREVIOUS COMMISSION ACTIONS OR BRIEFINGS**

May 23, 2017 – The Commission authorized design for the Variable Frequency Drive Renewal and Replacement (CIP #C800801).