

Staff Report

for the Regular Meeting of the Board of Directors, July 26, 2017

TO: Honorable Board of Directors

FROM: Keane Sommers, P.E., Hydroelectric Manager 

DATE: July 19, 2017

SUBJECT: Chicago Park Powerhouse Draft Tube Replacement Project

HYDROELECTRIC

RECOMMENDATION:

Approve the purchase of a new draft tube section for the Chicago Park Powerhouse from Unico Mechanical Corporation (UMC) in the amount of \$212,700, as well as a budget amendment, and authorize the General Manager to execute the appropriate documents as recommended by the Engineering Committee.

BACKGROUND:

Since its construction, the Chicago Park Powerhouse has likely had issues with a Rough Operating Zone (ROZ). However, changes in the energy market have caused the powerhouse to be run differently, making the problem more noticeable in recent years. Concrete damage caused by the ROZ was repaired in 2009 by Pacific Gas and Electric (PG&E). Recently, the damage has reappeared in the concrete encasing the draft tube, and the exposed steel section of the draft tube can be seen flexing when the powerhouse is generating at certain loads.

In order to minimize damage, the District has instituted a 'no run zone' between 17 and 23 Megawatts. While the 'no run zone' has been effective in limiting new damage, repairs must be made to the foundation and to the draft tube to ensure the long-term reliability of the unit. The powerhouse will likely continue to perform reliably for the foreseeable future; however, failure of the draft tube could result in substantial damage to the powerhouse and an extended outage.

In September of 2016, Engineers from Black and Veatch determined that the ROZ is hydraulic and related to the Classical Rheingans Frequency (CRF) or a swirl type vortex in the draft tube. The Department is currently investigating how best to

eliminate the swirl, but all parties involved in the investigation have recommended repairs to the concrete which are planned during the extended annual outage this fall. Due to the potential metal fatigue, the lower draft tube section must be replaced. In these situations most utilities replace the draft tube with a thicker walled version with the same connection geometry. Wall thickness will be increased from 0.375 inches to 0.630 inches.

Due to the specialized nature of fabricating the draft tube the number of shops available to complete this work is limited. Staff informally spoke with a local fabrication shop that said they could not complete the work. Staff contacted the two manufacturers in the region with the tooling, skill, and experience necessary to complete the work and requested a proposal. One of the manufacturers declined to bid. Staff recommends that the District purchase the draft tube from the only responsive company, Unico Mechanical Corporation (UMC).

BUDGETARY IMPACT:

Fabrication, testing, transportation, and installation of the new draft tube are expected to cost \$275,000. Repairs to the damaged concrete are expected to cost \$175,000. Therefore a total budget transfer of \$450,000 is required to complete this project. Placing the Loma Rica Powerhouse Project on hold results in unspent budget funds in 2017. Staff recommends transferring these funds to the Chicago Park Draft Tube Replacement Project and budgeting for the Loma Rica Powerhouse when the construction timing is more certain.

KSS

Attachments (2):

- Budget Amendment Request Form
- Slides for Board Presentation



**NEVADA IRRIGATION DISTRICT
BUDGET AMENDMENT REQUEST**

Request Number

Req. No BA 2017 - 49

Date: 7/18/2017
 To: Remleh Scherzinger, General Manager
 From: Keane Sommers, Hydroelectric Manager

Initial *ES*

Budget Transfer: Enter Operating/Capital Expenditure or Revenue line items.

| Department | Object / Account | Increase/(Decrease) |
|-------------------|----------------------------------|---------------------|
| 50112 Hydro Admin | 52915 Proj Bud: Non-Programmatic | \$ (450,000.00) |
| 50112 Hydro Admin | 52920 Proj Bud: Powerhouse Impr | \$ 450,000.00 |
| | | |
| | | |
| | | |
| | | |

Budget Increase: Enter Operating/Capital Expenditure or Revenue line items.

| Department | Object / Account | Increase/(Decrease) |
|------------|------------------|---------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

| Division Fund | Funding Account | Increase/(Decrease) |
|---------------|-----------------|---------------------|
| | | |
| | | |

Explanation: Enter narrative explaining reason for amendment.

Transfer funds from Project Budget: Non-Programmatic (52915) to Project Budget: Powerhouse Improvements (52920) to move money from Project 6947 Loma Rica Powerhouse, which is on hold, to Project 2133 Chicago Park Powerhouse Rough Operating Zone to repair draft tube. Budget Ammendment recommended to BoD at 7/26/17 Meeting.

APPROVALS:

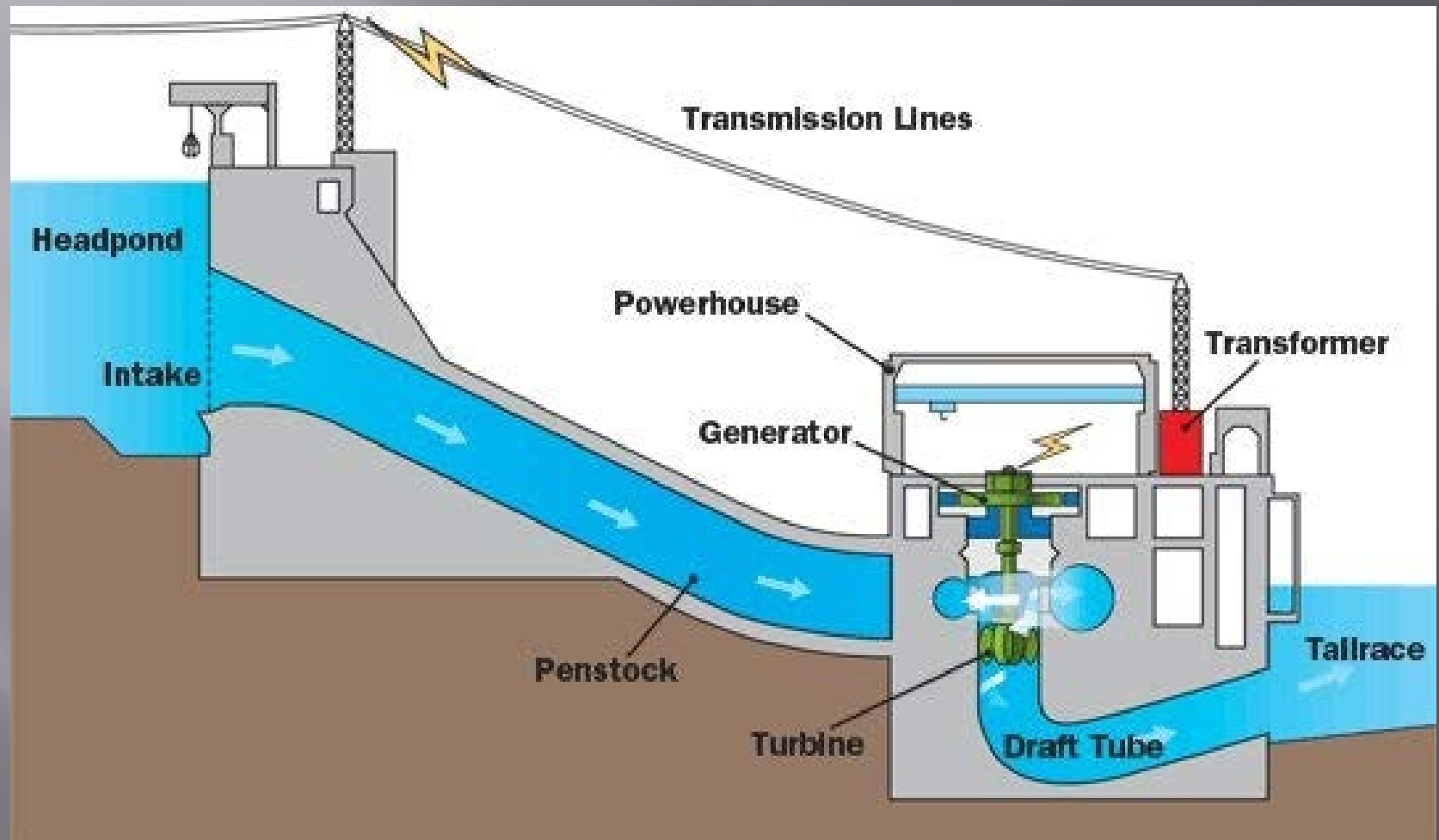
| | <u>Date</u> | <u>Signature</u> | <u>AGM/FM Initials</u> | <u>Approved/Denied</u> |
|------------|-------------|------------------|------------------------|------------------------|
| Level I: | | | | |
| Level II: | | | | |
| Level III: | | | | |

A photograph of a draft tube replacement project at Chicago Park. The image shows a concrete structure with a large draft tube extending upwards into a forested hillside. Water is flowing through the structure, creating a small waterfall. The surrounding area is lush with green trees and vegetation. The sky is clear and blue.

CHICAGO PARK DRAFT TUBE REPLACEMENT PROJECT

NID Board of Directors Meeting
July 26, 2017

Overview



Chicago Park Draft Tube



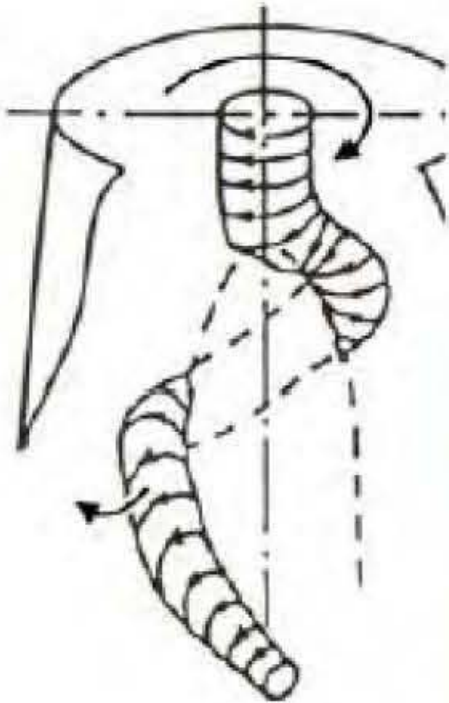
Background

- ▣ Rough Operating Zone (ROZ) at CPPH has likely existed since construction
- ▣ In the 1980s there was a significant weld repair made to the lower draft tube
- ▣ Draft tube repairs made in 2009
 - New, thicker, upper draft tube installed
 - Lower draft tube grouted
- ▣ Changes in the energy market making operating in the rough zone more likely

Study

- ▣ In September 2016 Black & Veatch diagnosed the root cause of the ROZ as Classical Rheingans Frequency (CRF)
- ▣ Best described as a swirl in the draft tube
- ▣ Swirl 'whips' the walls of the draft tube and occasionally collapses resulting in strong vibration

Classical Rheingans Frequency (CRF)



Chicago Park Draft Tube



Short Term Solution

- ▣ Avoid operating in the ROZ (17 – 23 MW)

Long Term Solution

- ▣ Resolving the CRF is still being studied
- ▣ Three potential solutions commonly applied
 - Air admission
 - Draft tube fins
 - Draft tube central column, hub extension
- ▣ Computational Fluid Dynamic (CFD) modeling required

Repairs

- ▣ Grout the concrete encased portion of the draft tube
- ▣ Construct a new removable section of draft tube out of thicker walled steel
 - Staff spoke to 3 manufactures only 1 responded
 - Unico Mechanical Corporation

Staff Recommendation

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