



● **Board of Directors**
Engineering and Capital Programs Committee

August 18, 2009 Board Meeting

7-2

Subject

Appropriate \$1.42 million; and authorize two rehabilitation projects at the San Dimas Hydroelectric Plant (Approp. 15458)

Description

This action authorizes the rehabilitation of deteriorated needle valves and components of the turbine at the San Dimas Hydroelectric Plant. The facility generates 9.9 megawatts (MW) of power under peak flow conditions and is Metropolitan's second largest power producer on an annual basis. The plant is presently out of service due to limited State Water Project (SWP) flows and the deteriorated condition of the needle valves.

Timing and Urgency

Rehabilitation work is needed at the San Dimas Hydroelectric Plant to minimize downtime of the plant and to maximize power generation. Over the past 1-1/2 years, there have been five incidents where the plant had to be shut down to adjust the needle valves. These adjustments burden other mechanical components, which must then deviate from their originally intended design. Rather than risk damaging otherwise properly functioning equipment, the plant was taken out of service in October 2008 so that the condition of the needle valves could be assessed. Staff recommends that this work proceed expeditiously in anticipation of higher SWP flows. The loss of revenue due to the plant's shutdown ranges from \$3,000 to \$11,000 daily; the payback period for the recommended work is less than two years.

These projects have been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria. Staff recommends moving forward with both projects at this time to enhance reliability of the existing conveyance/distribution system and to increase Metropolitan's use of renewable power. Both projects are categorized as Infrastructure Rehabilitation projects, and are budgeted within Metropolitan's CIP for fiscal year 2009/10.

Background

In the early 1970s, Metropolitan embarked on a program to develop hydroelectric power generation plants throughout the conveyance and distribution system. Sixteen small hydroelectric plants have been developed to date, ranging in capacity from 1 to 40 MW. These plants have produced \$24 million in average annual revenues over the past seven years, and are a reliable source of renewable energy.

Many of Metropolitan's hydroelectric plants have been in continuous use for over 30 years. While the facilities have received routine preventive maintenance, the rotating equipment and complex mechanical and electrical systems are exhibiting signs of normal wear and tear. Over the past three years, the plants have been shut down over 3,800 hours as a result of repairs.

In August 2008, the Board authorized a reliability study to assess the current condition of the hydroelectric plants and to identify cost-effective rehabilitation, repair, or replacement work. The assessment addressed the condition, age, redundancy, and operation and maintenance history of equipment such as turbine runners, generators, controls, transformers, and the structures that house this equipment.

The San Dimas Hydroelectric Plant was constructed in 1981 and has been in continuous service for over 27 years. The plant receives untreated SWP flows from the Department of Water Resources' Devil Canyon facility via the Rialto Pipeline. Flows are then delivered to the Weymouth plant through the La Verne Pipeline. The facility can produce up to 9.9 MW of electricity with its single turbine. Depending on pipeline flow rates, daily revenues range from \$3,000 to \$11,000. When the hydroelectric plant is shut down, flows are diverted through a separate pressure control structure in order to maintain water deliveries to the Weymouth plant. The hydroelectric plant is currently out of service due to the current low SWP allocation and due to the deteriorated condition of the needle valves, as discussed below.

The San Dimas Hydroelectric Plant operated reliably until November 2007, when the performance of some mechanical components began to diminish. Inspection and testing revealed that the plant's four 30-inch needle valves have deteriorated and no longer function properly. Needle valves open and close to either allow water through the impulse turbine or to shut off flow completely. Over the past 1-1/2 years, there have been five instances where the plant had to be shut down to adjust the damaged needle valves. These adjustments burden other mechanical components, which must then deviate from their originally intended design. The latest equipment malfunction occurred in October 2008. Rather than risk damaging otherwise properly functioning equipment, the plant was taken out of service to assess the condition of the needle valves. Coincidentally, due to limited SWP supplies, the plant is not operational at this time. There is currently an opportunity to execute these repairs so that the hydroelectric plant may resume operation once water supplies improve.

In addition to the deteriorated needle valves, inspections have revealed that coatings on internal components of the turbine, including the scroll case and tailrace, have deteriorated. Water travels through the scroll case to the needle valves and then exits through the tailrace. The coatings at both areas are almost entirely original. Aside from minor repairs, these components have not been re-coated since their original installation. Coal tar epoxy patches were previously applied to repair damaged coatings on the scroll case, but these have now loosened and are easily removed with a small knife. The metal beneath these removed patches is corroded. The tailrace area also has large areas with severe corrosion. Blistering, delamination, and rusting of the metal surfaces were observed on the tailrace. These damaged coatings expose the metal to accelerated rates of corrosion and eventual loss of steel. Areas that experience corrosion with limited loss of steel may be returned to service. However, more frequent inspection and monitoring are required to ensure corrosion is kept within manageable limits. Staff recommends refurbishing the scroll case and tailrace areas at this time. Refurbishing the scroll case and tailrace in conjunction with the needle valve repairs, as discussed below, will eliminate a future shutdown and improve efficiency of the repairs. The estimated life of the new coating is 20 years.

Project No. 1 - San Dimas Hydroelectric Plant Needle Valve Rehabilitation – Construction Phase (\$1,190,000)

This action appropriates \$1.19 million for construction phase activities for repair of the needle valves at San Dimas Hydroelectric Plant. The four 30-inch needle valves were identically constructed and were installed at the hydroelectric plant in 1981. All four valves have similar operation and maintenance records, and have experienced similar failures over the past 1-1/2 years. In January 2009, staff disassembled one needle valve to investigate the extent of damage and to assess repair options for all four needle valves. The assessment has been completed and staff recommends rehabilitation of all four valves. Planned work includes disassembly of the valves, replacement of worn or damaged valve components, sandblasting and recoating of the valve body, cleaning and recoating of the plunger, spring, actuator shaft and deflector plate, and fabrication of new retaining rings. All work will be performed by Metropolitan forces with technical support from Fuji Electric Company. Fuji fabricated and installed the needle valves originally, and has proprietary knowledge of the design and operation of these valves. Requested funds include \$167,000 for the assessment study, \$785,000 for Metropolitan force labor, \$37,000 for materials and supplies, \$10,000 for equipment use and incidental expenses, \$31,000 for project management activities, \$10,000 for a technical support contract with Fuji, and \$150,000 for remaining budget.

Metropolitan force labor includes disassembly, removal and transport of the valves to Metropolitan's fabrication shop in La Verne (\$140,000), repair of the four valves as discussed above (\$220,000), reassembly of the valves

(\$140,000), transport and reinstallation of the valves (\$240,000), and final performance testing (\$45,000). Photos of an existing needle valve appear in [Attachment 3](#).

Project No. 2 - San Dimas Hydroelectric Plant Scroll Case and Tailrace Refurbishment – Construction Phase (\$230,000)

This action appropriates \$230,000 for construction phase activities for refurbishment of the San Dimas Hydroelectric Plant's turbine scroll case and tailrace areas. Staff recommends removal of the existing coating, repair of corroded and pitted metal, and recoating of metal at both the scroll case and tailrace areas. All work will be performed by Metropolitan forces. Requested funds include \$135,000 for Metropolitan force labor, \$18,000 for materials and supplies, \$24,000 for equipment use and incidental expenses, and \$53,000 for remaining budget.

Metropolitan force labor includes installing a containment zone; blasting the old coating off the internal components of the turbine, including the scroll case and tailrace; inspecting the steel condition and repairing as needed, applying new coating; and removing the containment zone.

Summary

This action appropriates \$1.42 million in budgeted funds and authorizes two rehabilitation projects at the San Dimas Hydroelectric Plant. These projects are consistent with Metropolitan's goals for sustainability by enhancing the reliability of the distribution system and increasing Metropolitan's use of renewable power. Given board approval, it is anticipated that all work will be completed by February 2010.

See [Attachment 1](#) for the Financial Statement, [Attachment 2](#) for the Location Map, and [Attachment 3](#) for the Needle Valves photos.

Project Milestones

August 2009 – Completion of scroll case and tailrace refurbishment

February 2010 – Completion of needle valve rehabilitation

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

California Environmental Quality Act (CEQA)

CEQA determination for Options #1 and #2:

The proposed actions are categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The overall activities involve the funding, design, minor alterations and replacement of existing public facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed action qualifies under Class 1 and Class 2 Categorical Exemptions (Sections 15301 and 15302 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed action qualifies under two Categorical Exemptions (Class 1, Section 15301 and Class 2, Section 15302 of the State CEQA Guidelines).

CEQA determination for Option #3:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Appropriate \$1.42 million; and
- b. Authorize rehabilitation of the needle valves and turbine components at the San Dimas Hydroelectric Plant.

Fiscal Impact: \$1.42 million of budgeted funds (Approp. 15458)

Business Analysis: This option will improve reliability of the San Dimas Hydroelectric Plant, reduce the risk of damage to other major equipment, and allow generation to resume, producing revenues of as much as \$11,000 per day. This project will also provide renewable, green energy that will contribute to Metropolitan’s sustainability goals.

Option #2

Adopt the CEQA determination and

- a. Appropriate \$1.19 million;
- b. Authorize rehabilitation of needle valves at the San Dimas Hydroelectric Plant; and
- c. Do not authorize refurbishment of the turbine components at this time.

Fiscal Impact: \$1.19 million of budgeted funds (Approp. 15458)

Business Analysis: This option will improve reliability of the San Dimas Hydroelectric Plant, reduce the risk of damage to other major equipment, and allow generation to resume, producing revenues of as much as \$11,000 per day. This project will also provide renewable, green energy that will benefit and contribute to Metropolitan’s sustainability goals. This option will forego an opportunity to perform needed refurbishment of the turbine’s scroll case and tailrace at this time. The coatings would continue to deteriorate and accelerated corrosion would require more extensive repairs in the future, during a later shutdown.

Option #3

Do not authorize rehabilitation of the San Dimas Hydroelectric Plant.

Fiscal Impact: Continued loss of revenue of \$3,000 to \$11,000 daily

Business Analysis: The hydroelectric plant will remain out of operation, which would forego an opportunity to produce renewable energy. Depending on available flow, this option would eliminate potential revenues of up to \$11,000 per day.

Staff Recommendation

Option #1



 Roy L. Wolfe
 Manager, Corporate Resources

7/27/2009

 Date



 Jeffrey Lightlinger
 General Manager

7/31/2009

 Date

[Attachment 1 – Financial Statement](#)

[Attachment 2 – Location Map](#)

[Attachment 3 – Photos of Needle Valves](#)