



**KING COUNTY**

1200 King County Courthouse  
516 Third Avenue  
Seattle, WA 98104

**Signature Report**

**June 1, 2010**

**Motion 13246**

**Proposed No. 2010-0263.1**

**Sponsors Phillips**

1           A MOTION approving a report on the options and  
2           recommending a strategy for providing emergency backup  
3           power for the South treatment plant in Renton as required  
4           in a 2009 budget proviso.

5           WHEREAS, King County in response to heightened risk of flooding of the Green  
6           river due to seepage at the Howard Hanson dam has taken steps to prepare for a potential  
7           flood, and

8           WHEREAS, an interruption of electrical power at the South treatment plant was  
9           one of many concerns with regard to potential flooding, and

10          WHEREAS, as an interim measure, backup power has been provided through a  
11          lease of diesel generators that were installed on a temporary basis at the South treatment  
12          plant, and

13          WHEREAS, it will likely take several years to improve levees and repair the  
14          Howard Hanson dam so that flooding becomes much less of a threat, and

15          WHEREAS, the King County council has requested that the King County  
16          executive provide a report to the council analyzing the options and recommending a  
17          strategy for providing emergency backup power for the South treatment plant in Renton  
18          in the future, and

19           WHEREAS, the risk of flooding has been reduced by actions taken by the United  
20 States Army Corps of Engineers to install an interim grout curtain, and

21           WHEREAS, the risk of power outages has also been reduced by actions taken by  
22 Puget Sound Energy to protect its infrastructure, and

23           WHEREAS, these improvements reduce risk of power loss at the South treatment  
24 plant to the extent that backup generators are no longer needed;

25           NOW, THEREFORE, BE IT MOVED by the Council of King County:

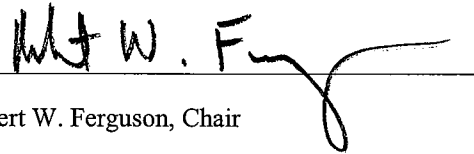
26           The report addressing the wastewater treatment division's analysis of the options

27 and recommending a strategy for providing emergency backup power at South treatment  
28 plant in Renton is hereby approved.  
29

Motion 13246 was introduced on 4/26/2010 and passed by the Metropolitan King County Council on 6/1/2010, by the following vote:

Yes: 8 - Ms. Drago, Mr. Phillips, Mr. von Reichbauer, Mr. Gossett,  
Ms. Hague, Ms. Lambert, Mr. Ferguson and Mr. Dunn  
No: 0  
Excused: 1 - Ms. Patterson

KING COUNTY COUNCIL  
KING COUNTY, WASHINGTON

  
\_\_\_\_\_

Robert W. Ferguson, Chair

ATTEST:

  
\_\_\_\_\_

Anne Noris, Clerk of the Council

**Attachments:** A. Report on Options and Recommendation of a Strategy for Providing Emergency Backup Power for the South Treatment Plant

**Report on Options and Recommendation of a Strategy for Providing  
Emergency Backup Power for the South Treatment Plant  
Wastewater Treatment Division,  
King County Department of Natural Resources and Parks**

April 2010

**Introduction**

This document provides information, analysis and recommendations from King County's Wastewater Treatment Division (WTD) in response to a proviso in WTD's 2009 capital budget (contained in Section 127 of Ordinance 16312, as amended by Section 8 of Ordinance 16680), which reads as follows:

*The executive shall provide a report to the council by February 11, 2010, analyzing the options and recommending a strategy for providing emergency backup power for the South Treatment Plant in Renton in the future. The analysis should address issues and variables including:*

*a. providing backup power for the next three to five years or permanently; b. lease versus purchase of equipment; c. temporary versus permanent facilities; d. local, state and federal regulatory issues; e. wastewater treatment division budget impacts under various financing strategies; f. opportunities for partnering with other agencies or utilities; and g. opportunities for recouping or realizing revenues from emergency power backup investments.*

This report is organized into separate sections addressing each element of the proviso in the order requested:

- Section I provides background information on the Green River flood danger. In this context, it describes WTD's emergency backup power program for 2009-10 in response to the declaration by the United States Army Corps of Engineers (USACE) that damage had been discovered on the right abutment at the federally-owned and operated Howard Hanson Dam and that as a result the risk of significant flooding in King County's Green River valley had dramatically increased.
- Section II identifies various options for providing emergency backup power, including lease versus purchase options. This section also addresses the issue of temporary versus permanent facilities.
- Section III discusses local, state and federal regulatory issues regarding the various options.

- Section IV explores budgetary impacts, financing options, and opportunities for partnering with other agencies or utilities and producing revenue or recouping costs.
- Section V provides conclusions reached with regard to the various options discussed.

## **Section I. Emergency Backup Power Plan for 2009-10**

This section describes WTD's emergency backup power plan for the winter of 2009-10. In January 2009, the USACE discovered depressions that had developed in an abutment to the Howard Hanson Dam. While the dam was not directly affected by the depressions, the USACE reported that in the future the storage capacity of the dam would be reduced to roughly a third of normal, potentially resulting in significantly more water than usual being released down the river.

By July, the USACE had formulated plans for a temporary fix where grout would be injected into the abutment. During the summer and early fall, the USACE predicted that the odds of major flooding in the Green River valley were 1-in-3. This was prior to completion of the interim flood control projects, improvements of the drainage tunnel and installation of the grout curtain that the USACE started in summer 2009. By November, the interim projects were essentially complete and the USACE revised the odds of major flooding to 1-in-25. Seepage in the abutment was still a concern and the USACE noted that it would be taking additional steps depending on various factors such as weather forecasts, flows up- and downstream from the dam, levee conditions, and seepage monitoring. The USACE will be testing the grout curtain this Spring, which will provide additional information on the effectiveness of these interim repairs. In addition, the USACE recently announced that it has developed a plan for a second phase of grouting that could return the dam to its original flood protection capacity by as early as November, 2010, depending on the timing of federal appropriations. The second phase of grouting would also be an interim measure that would provide protection during construction of the permanent repairs. The USACE anticipates that the additional grouting would further reduce the chances of flooding in the Green River Valley to 1 in 140, the full protective capacity that the dam was designed to provide.

Part of the flood prevention and mitigation measures employed by King County included ensuring there was enough backup power on-site at the South Treatment Plant to run the plant at peak flows even if both power feeds to the plant were down. To provide the electrical power, WTD moved forward with an interim power backup plan. WTD leased nine diesel generators capable of producing 16.2 million watts (MW) of electricity. This amount of power, along with that produced by on-site gas turbines (6.8 to 8 megawatts), would be sufficient to operate the plant at full capacity. Thus, if power supplied by Puget Sound Energy (PSE) became unavailable, the combination of the diesel generators and the gas turbines would be able to keep the plant operational. In addition to the generators, this temporary backup power plan required that a large quantity of diesel fuel be stored and available at the treatment plant. A quantity of about 132,000 gallons of diesel fuel was on hand stored in five rail cars. The diesel generators could be operated for up to five days on the quantity of fuel stored on-site. The generators would

consume up to 110 gallons per hour each, using nearly 24,000 gallons in a 24-hour period at a cost of nearly \$64,000 per day.

**Section II. Emergency Backup Power Options**

**Diesel Generators – Lease**

As described above, temporary on-site diesel generators were the solution chosen for the winter of 2009-10. Nine CAT XQ2000 generators were leased from NC Power Systems along with ancillary equipment for five months at a cost of \$397,539 per month.<sup>[1]</sup> In addition, the aforementioned five rail cars of diesel fuel are at the South Treatment Plant. The fuel cost was \$355,975. WTD has an agreement with Associated Petroleum Products and King County Metro Transit to repurchase the unused diesel fuel. As of March 16, 2010, this process is well underway with approximately 31 percent of the fuel resold. Current prices indicate the full cost of the fuel may be recoverable. Until the unused fuel is sold, the final cost of the backup plan for this winter is contingent on the disposition of the diesel fuel and the price received if sold. Prior to sale of the fuel, the cost of this interim backup plan is as shown in the following table:

Table 1  
Estimated 2009-10 Emergency Power Backup Plan Costs

Element	Cost
Generator lease – 9 CAT XQ2000 generators*	\$1,987,696
Generator delivery and testing charges	76,850
Various rentals	73,193
Diesel fuel (132,904 gallons @ \$2.68 per gallon, including taxes)	355,975
Site preparation, engineering and miscellaneous costs	734,083
Totals	\$3,227,797

\* Lease includes the generators and associated equipment, such as step-up transformers, cables, disconnect switches, fuses and Shore Power transformer.

If King County were to continue to lease generators on a temporary basis, the cost would likely be somewhat less because the site preparation costs would not be incurred again.

While Puget Sound Clean Air Agency has noted that a permit from them would not be needed to employ the generators again next winter, the City of Renton has preliminarily voiced reluctance to issue a permit for such a solution. The city’s concerns are mainly with the storage of diesel on-site in rail cars.

**Diesel Generators - Purchase**

A second option would be to make diesel generators the permanent backup power solution. Under this option, the nine generators currently under lease, or nine generators to be purchased at

<sup>[1]</sup> The lease term runs from October 15, 2009, to March 15, 2010. The county has an option to extend the lease for one month at the same rate.

a later time, would be installed permanently at South Treatment Plant. This option would include a permanent storage solution for diesel rather than storing diesel on-site in rail cars. The City of Renton remains reluctant to permit this option as the city remains concerned with the safety of the diesel.

In December 2009, NC Power Systems, the lessor for the generators, provided purchase options for the generators. Should the county wish to purchase the generators in order to make this the permanent backup power solution, purchase prices at various stages of the lease are as follows:

Table 2  
Generator Purchase Options

Item	Quantity	Sale Price	After 3 <sup>rd</sup> Month	After 4 <sup>th</sup> Month	After 5 <sup>th</sup> Month
XQ2000 Generator	9	\$7,641,676	\$7,206,061	\$7,109,537	\$7,085,821
Associated equipment	9	1,066,855	666,884	530,884	393,525
Associated equipment	1	79,240	40,480	27,301	13,990
Shore Power transformer	1	18,450	9,313	6,206	3,068
Totals*		\$8,806,221	\$7,922,738	\$7,673,928	\$7,496,404

\*Prices do not include sales tax

Harris Group, Inc. has provided a very preliminary estimate of the cost of making the generators a permanent installation. Its estimate of \$20.5 million includes the nine generators at a cost of \$13.5 million and a 400,000-gallon storage tank. The tank would eliminate the rail cars for storage of the diesel. Also, exercising an option to purchase the existing generators could reduce the total cost from the \$20.5 million by \$4 million to \$5 million. This estimate should, however, be viewed only as a planning level estimate.

In addition to the construction and purchase of the generators, the XQ2000's would require upgrades to meet air quality standards. These upgrades, likely needed within two years, would cost roughly \$200,000 per generator or \$1.8 million.

### **Co-Generation – Gas Turbines**

Another option to address peak power needs if both power feeds are down is to expand cogeneration. To meet this peak flow demand, a new cogeneration facility with two gas turbines (with a capacity of 7-8 MW each) would be required. The cost of adding these gas turbines is not known. A very preliminary estimate by Harris Group, Inc. was that this permanent solution would entail construction costs of between \$52 million and \$60 million. Natural gas from PSE would be the main fuel that powers these new gas turbines as well as the existing cogeneration facility.

As a long-term backup power option, cogeneration presents at least two problems:

1. The high cost of adding gas and steam turbines in a permanent installation with enough capacity to produce electricity in sufficient quantity to operate the plant during a peak flow event - \$52 million to \$60 million; and,

2. The need to purchase natural gas to power most of these generators because of the relatively small amount of methane gas production at the South Treatment Plant.

In the short-term, cogeneration is not viable because it would take too long to permit, design and construct.

### **Puget Sound Energy Option**

Puget Sound Energy provides power to the South Treatment Plant through two separate electrical feeds. Over the last 24 years, both feeds were out of service for approximately a total of 10 minutes. Based on that experience, the probability of losing all power at the plant is extremely remote. However, the situation with the Howard Hanson Dam did not exist during those 24 years.

In the case of a significant flood because the dam is not able to store as much water, the main concern was that Puget Sound Energy's power feeds would be impacted by flood waters or debris in the flood waters. Also, power vaults in the ground could be flooded. Given these circumstances, PSE has recently undertaken several projects to protect its facilities in case of a flood. These include a four-foot high HESCO flood barrier around the O'Brien substation and caulking and waterproofing junction boxes at the Interurban Pump Station.

Given the reduced risk of flooding and the flood prevention upgrades installed by Puget Sound Energy, returning to reliance on the two power feeds is now considered a viable option.

### **Section III. Local, State and Federal Regulatory Issues**

As noted above, the Puget Sound Clean Air Agency's regulations allowed for the generators on a temporary basis for this winter and would also allow them for winter of 2010-11. Its regulations provide that a temporary installation of non-road engines that meet certain requirements and that are physically on site for 364 days or less during a given year are exempt from the requirement to submit a "Notice of Construction" for up to two years.

A temporary or permanent installation would be subject to obtaining various permits from the City of Renton, including a conditional use permit, a clearing and grading permit, a building permit, a fire permit, and electrical and mechanical permits. Renton agreed to the generator solution as an emergency provision for the 2009-10 flood season. However, Renton has indicated it is not likely to approve this program for the next flood season or on a permanent basis.

### **Section IV. Budgetary Impacts, Financing Options, Partnering Opportunities and Revenue Generation**

Budgetary Impacts:

Leasing generators has a significant impact on the operating budget. As seen earlier in this report, costs during 2009-10 will be more than \$3 million. Some costs already incurred would not have to be repeated in future years but the major cost is the generator lease and fuel and this



expenditure would be necessary each year that this solution is used. Generators also have significant permitting requirements.

Any permanent installation would have both capital and operating budget impacts and the costs are \$20 million to \$60 million for permanent installation of generators or cogeneration.

#### Financing Options:

Additional permanent backup power systems could be financed through the WTD capital program. Another option would be a lease purchase of the generators. However, other improvements with a longer useful life would still cost in the \$15 million range and would be more appropriate for bond financing.

A much more costly permanent solution is cogeneration. Very preliminary cost figures put this in the \$52 million to \$60 million range. As previously noted, this option has a major drawback in that it would have to rely on purchased natural gas during peak demand periods as scrubbed methane is not produced in sufficient quantities to operate the plant during high flow periods. The reliability of natural gas sources has not been analyzed but could also be subject to disruption during a flood or other natural disaster.

## **Section V. Conclusion**

The Green River flood danger brought to bear an immediate need to address a likely natural disaster. Certainly, continued operation of the South Treatment Plant during such a disaster would be critical to recovery and prevention of damage from the flood. The existing cogeneration facility can provide up to 8MW of electricity, when as much as 24MW may be required to provide full treatment during a flood event. Initially, it was unclear how reliable the PSE electrical system and gas supply system would be. Thus, a decision was made to temporarily install nine generators with a combined capacity of about 16MW, and store sufficient diesel on-site to power these generators at full capacity for five days.

The available permanent solutions to backup power at South Treatment Plant comprise a short list and they are both expensive and take time to install. Certainly, this past winter has provided the county and WTD with more information, experience and time to plan for a backup power solution for either a flood or other natural disaster. The combined efforts of the United States Army Corps of Engineers, Puget Sound Energy and King County these past six months have significantly reduced the likelihood of a severe flood, as well as the impact of such a flood.

Based on the discussion in this report of the various options, the reduced flood threat, and significant flood prevention efforts employed by Puget Sound Energy, the recommendation by WTD is to go back to relying on the two power feeds and the current cogeneration system. In this scenario, the current lease of the generators will not be renewed and the permanent solutions discussed earlier in this report would not be pursued. However, discussions with Puget Sound Energy will continue to explore ways of securing the electricity feed to the South Treatment Plant in the event of emergency conditions.