




MEMORANDUM

DATE: September 15, 2010
Updated March 28, 2012

TO: Pratt 2.1 File
2010 Funding EPA CWSRF
KWPCRF Project No.: C20 1799 01

FROM: Rod Geisler, PE, Chief Municipal Programs Section 

SUBJECT: Pratt, Kansas
Project to Upgrade Sludge Wasting, Digestion, Thickening,
Dewatering, Storage, and Disposal.
EPA Green Project Reserve

Similar to the ARRA funding effort, the Federal Clean Water SRF funding provided in FFY 2010 requires a 20% "Green Project Reserve" (GPR) for use of the federal funds. EPA wrote new guidance to define qualifying uses for the Green Project Reserve requirements for the FFY 2010 funding, dated April 21, 2010 (copy attached). As stated on page 1, paragraph "II. GPR Goals." The "intent" is "to guide funding toward projects that...enhance water and energy conservation...". The project at Pratt, Kansas, achieves this goal by substantially reducing energy usage in the sludge handling and disposal processes.

The project being funded will remove the primary clarifiers, add improved SCADA controls for wasting activated sludge from the SBR system and add an upgraded waste activated sludge pumping station, convert the existing anaerobic digesters to aerobic digesters with the addition of a high purity oxygen infusion aeration process, add belt press sludge dewatering equipment in a new building, and an open building to store dewatered sludge prior to disposal to landfill and/or land application reuse of biosolids. A review of the FFY 2010 GPR guidance as presented below indicates this project meets the requirements to qualify as a Green Project Reserve project in accordance with these Federal guidelines.

0.1 All GPR projects must otherwise be eligible for CWSRF funding.

- The project at Pratt is eligible.

0.2 All Section 212 projects must be consistent with the definition of "treatment works" as set forth in Section 212 of the Clean Water Act (CWA).

- The project at Pratt is a "Section 212" project, the wastewater treatment plant is publicly owned, and the project will have a direct water quality benefit by improving the

efficiency and flexibility of waste sludge wasting, storage, disposal, and potential reuse of biosolids from the treatment process, and also improving biosolids quality.

0.3 Eligible non-point source projects...

- NA. This is not a non-point source project.

0.4 Eligible projects under Section 320...

- NA. This is not a Section 320 project.

0.5 GPR projects must meet the definition of one of the four GPR categories.

- See below

0.6 GPR project must further the goals of the Clean Water Act.
CWSRF Technical Guidance

1.0 Green infrastructure

- NA

2.0 Water Efficiency

- NA

3.0 Energy Efficiency

3.1 Definition: Energy efficiency is the use of improved technologies and practices to reduce the energy consumption of water quality projects, use energy in a more efficient way, and/or produce/utilize renewable energy.

- The project at Pratt achieves this goal by reducing energy consumption in sludge treatment, storage, and disposal, and improved biosolids quality for potential reuse.

3.2 Categorical Projects

3.2.1 Renewable energy projects such as wind, solar, geothermal, micro-hydroelectric, and biogas combined heat and power systems (CHP) that provide power to a POTW. (<http://www.epa.gov/cleanenergy>). Micro-hydroelectric projects involve capturing the energy from pipe flow.

- NA

3.2.2 Projects that achieve a 20% reduction in energy consumption are categorically eligible for GPR⁴. Retrofit projects should compare energy used by the existing system or unit process to the proposed project. The energy used by the existing system should be based on name plate data when the system was first installed, recognizing that the old system is currently operating at a lower overall efficiency than at the time of installation. New POTW projects or capacity expansion projects should be designed

to maximize energy efficiency and should select high efficiency premium motors and equipment where cost effective. Estimation of the energy efficiency is necessary for the project to be counted toward GPR. If a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case.

⁴The 20% threshold for categorically eligible CWSRF energy efficiency projects was derived from a 2002 Department of Energy study entitled *United States Industrial Electric Motor Systems Market Opportunities Assessment, December 2002* and adopted by the Consortium for Energy Efficiency. Further field studies conducted by Wisconsin Focus on Energy and other States programs support the threshold.

⁵A unit process is a portion of the wastewater system such as the collection system, pumping stations, aeration system, or solids handling, etc.

- The project at Pratt meets this GPR qualifying criteria as the consulting engineer has conducted a comparison of energy use of the solids handling components of the existing wastewater treatment facility to the proposed upgrade alternatives. Copies of pages 12 and 13 of the Engineering Report dated August 2010 are attached to this memo. Copies of several pages from the Design Memorandum dated March 2012 are also attached to this memo.

The consulting engineer compared energy use in all forms – electricity, natural gas, and motor (diesel) fuel – by the “common denominator” of cost in dollars. The current treatment project is spending \$28,834 (2010) per year on energy costs for solids handling. The selected alternative is estimated to require \$17,822 per year for energy costs for solids handling. The energy costs of 7¢ per kW.h electricity, \$7.33 per MCF natural gas, and \$4.50 per gallon for diesel fuel are actual 2010 year costs. These energy costs are sure to increase in the future but this “future inflationary pressure” was not considered. If this were to be considered, the future energy costs saving would be increased.

By these numbers, the project at Pratt will reduce energy usage by $(\$28,834 - \$17,822) / 28,834 = 38.2\%$ for sludge handling, which exceeds the minimum 20% threshold in the EPA guidance.

3.2-3 Collection system Infiltration/Inflow (I/I) detection equipment

- NA

3.2.4 POTW energy management planning...

- NA

3.3 Projects that do not meet the definition of Energy Efficiency.

- NA

3.4 Decision Criteria for Business Cases

- NA

3.5 Examples of Projects Requiring a Business Case

- NA

4.0 Environmentally Innovative

- NA

Therefore, the project at Pratt meets the EPA definition of being “categorically” green. The loan agreement will provide 15% principal forgiveness for all engineering and construction costs, and will also provide an additional 25% principal forgiveness for the cost of construction of the qualifying “green design components” based on the approved bid form and a proportionate amount of the engineering costs, up to a maximum amount provided for principal forgiveness of \$656,800. Based on information presently available, nearly the entire project qualifies as “green design components”.

The updated estimated total cost of the project is \$2,118,200. Nearly the entire cost is considered a “green design” contributing to energy use reduction with those components eligible for 40% principal forgiveness, subject to final review of design plans and specifications. A follow up memo will provide the final eligibility review based on actual bid costs for the record.

Attached

- Excerpts from the Engineering Report dated August 2010 (2 pp)
- Excerpts from the Design Memorandum dated March 2012 (4 pp)

Enclosures

- FFY 2010 EPA GPR Guidance

Pc: Larry Molder, II, Rod Geisler (Memo Only)

**ENERGY ANALYSIS FOR SLUDGE HANDLING
WASTEWATER TREATMENT FACILITY UPGRADE
PRATT, KANSAS**

Discount Rate 4.40% Discount Rate From 2010 Federal Register OMB Circular A-94
 Design Period 40 Years - Typical design life of Sewage Treatment Plant Process
 Cost per KWH \$ 0.07

EXISTING WASTEWATER TREATMENT FACILITY ENERGY COSTS (FOR REFERENCE ONLY)										
Energy	Description	Electric Motors				Annual Usage	Unit	Cost per Unit	Present	40
		No.	Hp	Efficiency	Hrs/Day				Annual Cost	Year FV
Elec.	Primary Clarifiers	2	0.5	50%	24	13,070	KWH	\$0.07	\$915	\$95,603
Elec.	Boiler	3	0.5	50%	24	19,605	KWH	\$0.07	\$1,372	\$143,404
Elec.	Sludge Recirculation Pump	1	2	40%	24	32,675	KWH	\$0.07	\$2,287	\$239,007
Elec.	Digester Grinder Pump	1	3	40%	24	49,012	KWH	\$0.07	\$3,431	\$358,511
Elec.	Digester Blower Mixer	1	5	50%	12	32,675	KWH	\$0.07	\$2,287	\$239,007
Elec.	Piston Sludge Pump	2	2	40%	3	8,169	KWH	\$0.07	\$572	\$59,752
N.G.	Boiler Natural Gas Usage					2,289	MCF	\$7.33	\$16,778	\$1,753,276
Diesel	Diesel Fuel (Sludge Hauling)					900	GAL	\$3.20	\$2,880	\$300,949
	Subtotal								\$30,523	\$3,189,511

USING EXISTING ANAEROBIC DIGESTERS WITH BELT FILTER PRESS										
Energy	Description	Electric Motors				Annual Usage	Unit	Cost per Unit	Present	0
		No.	Hp	Efficiency	Hrs/Day				Annual Cost	Year FV
Elec.	Primary Clarifiers	2	0.5	50%	24	13,070	KWH	\$0.07	\$915	\$95,603
Elec.	Boiler	3	0.5	50%	24	19,605	KWH	\$0.07	\$1,372	\$143,404
Elec.	Sludge Recirculation Pump	1	2	40%	24	32,675	KWH	\$0.07	\$2,287	\$239,007
Elec.	Digester Grinder Pump	1	3	40%	24	49,012	KWH	\$0.07	\$3,431	\$358,511
Elec.	Digester Blower Mixer	1	5	50%	12	32,675	KWH	\$0.07	\$2,287	\$239,007
Elec.	Piston Sludge Pump	2	2	40%	3	8,169	KWH	\$0.07	\$572	\$59,752
Elec.	Belt Filter Press	1	23	60%	0.1	1,044	KWH	\$0.07	\$73	\$7,635
N.G.	Boiler Natural Gas Usage					2,289	MCF	\$7.33	\$16,778	\$1,753,276
	Subtotal								\$27,716	\$2,896,197

UPGRADE TO AEROBIC DIGESTERS & USE BELT FILTER PRESS FOR SLUDGE DISPOSAL										
Energy	Description	Electric Motors				Annual Usage	Unit	Cost per Unit	Present Annual Cost	40 Year FV
		No.	Hp	Efficiency	Hrs/Day					
Elec.	Digester Diffused Blower - 700 SCFM	2	39.3	60%	4	141,970	KWH	\$0.07	\$9,938	\$1,038,474
Elec.	Digester Diffused Blower - 65 SCFM	2	6	44%	6	44,862	KWH	\$0.07	\$3,140	\$328,157
Elec.	Sludge Discharge Pumping	2	2	50%	0.14	305	KWH	\$0.07	\$21	\$2,231
Elec.	Piston Sludge Pump	2	2	40%	0.5	1,361	KWH	\$0.07	\$95	\$9,959
Elec.	Belt Filter Press	1	23	60%	0.1	1,044	KWH	\$0.07	\$73	\$7,635
Subtotal									\$13,268	\$1,386,455

CANNIBAL SOLIDS REDUCTION SYSTEM										
Energy	Description	Electric Motors				Annual Usage	Unit	Cost per Unit	Present Annual Cost	40 Year FV
		No.	Hp	Efficiency	Hrs/Day					
Elec.	Rotary Drum Screens					6,532	KWH	\$0.07	\$457	\$47,780
Elec.	Screw Presses					19,597	KWH	\$0.07	\$1,372	\$143,347
Elec.	Floating Mixers					13,827	KWH	\$0.07	\$968	\$101,141
Elec.	Coarse Bubble Aeration					21,230	KWH	\$0.07	\$1,486	\$155,292
Elec.	Centrifuge	1	15	69%	2	11,839	KWH	\$0.07	\$829	\$86,597
Elec.	Sludge Discharge Pumping	2	2	50%	0.04	87	KWH	\$0.07	\$6	\$637
Elec.	Piston Sludge Pump	2	2	40%	0.1	272	KWH	\$0.07	\$19	\$1,992
Elec.	Belt Filter Press	1	23	60%	0.1	1,044	KWH	\$0.07	\$73	\$7,635
Subtotal									\$5,210	\$544,420

SLUDGE HANDLING LONG TERM COST ANALYSIS

The annual operational costs, not including energy costs, for the three sludge handling alternatives is approximately the same. As such, administrative, labor materials and service have not been included in the long term cost analysis. Based on the process life of 40 years and a 20 year equipment life with an interest borrowing rate of 2.75%, the average annual sludge handling cost for energy and debt service over the next 20 years for each alternative is as follows:

DESIGN MEMORANDUM

on the
WASTEWATER TREATMENT FACILITIES

at
PRATT, KANSAS
MARCH 2012

KDHE Project No.: C20-1799 01



EBH
& Associates
Evans-Bierly-Hutchison & Associates, P.A.

6.0 COST

6.1 ESTIMATED OPERATING COSTS

In order to qualify for the US EPA "Green" debt forgiveness, the improvements must show a minimum of a 20% savings in energy costs. The use of the high purity oxygen system should provide a significantly greater energy cost savings over operation of the anaerobic digester. Estimates for the energy costs for the existing facility are shown on Table 6 and energy costs for the proposed alternative, both current and future anticipated conditions, are presented on Table 7. The future value of these costs were calculated all in a similar manner using the discount rate, design period and energy cost as indicated in Table 6. As shown on the Tables, the Present Annual Cost is \$28,834, and the estimated Present Annual Cost for current and future conditions with the digester improvements is \$17,822 and \$21,238, respectively. This indicates an estimated energy savings over the anaerobic digester operation cost of approximately 38% and 26%, respectively. In addition, there should be flexibility in the operation of the high purity oxygen so once it is in operation it can be optimized for the conditions at hand.

6.2 OPINION OF PROBABLE CONSTRUCTION COST

The Opinion of Probable capital cost is based on budgetary-level estimated construction costs. The original Engineering Report presented an estimated construction cost of \$1,292,000 for the selected option and a total cost of \$1,642,000. The attached Opinion of Probable Cost includes some line items that were not included within the Scope of Work presented in the Engineering Report but if added improve the plant operations, improve the process, and make operations and maintenance easier. See Section 3.0 for further discussion.

Since current equipment prices have risen and continue to rise, and because the current shortage of work for contractors has kept labor costs lower, it is difficult to predict the actual construction cost. However, good values are being had with regards to major capital improvements projects. In the bid, three of the additional items will be bid as alternatives so the City can decide if they can afford to install these improvements. These three items will include the maintenance shop, the equalization tank covers, and the sludge sump for the equalization basin.

The contingency line item is higher than would normally be expected. A standard 10% of the construction cost contingency is included. In addition to the 10% contingency, an additional \$380,000 is included in case the digester tank requires internal repair to the concrete. It is not possible to inspect the interior of the digester tanks until they are taken out of service. It is assumed that some repair will be required on the interior but the necessity, or extent, will not be determined until the covers are removed and the tanks cleaned. A contingency for this item is included, but it may or may not be needed.

Table 8 provides the Opinion of Probable Construction Cost for the improvements.

**TABLE 6. Energy Savings Analysis, Existing Conditions
Pratt Wastewater Treatment Plant**

Discount Rate: 3.80% Nominal Discount Rate From December 2011 Federal Register OMB Circular A-94
 Design Period: 40 Years Typical design life of Sewage Treatment Plant Process
 Cost per KWH: \$ 0.07

EXISTING STF AS PRESENTLY OPERATING										
Energy Type	Description	Electric Motors				Annual Usage	Unit	Cost per Unit	Present Annual Cost	40 Year FV
		No.	Hp	Efficiency	Hrs/Day					
Elec.	Primary Clarifiers	2	0.5	50%	24	13,070	KWH	\$ 0.07	\$ 915	\$82,948
Elec.	Boiler	3	0.5	50%	24	19,605	KWH	\$ 0.07	\$ 1,372	\$124,422
Elec.	Sludge Recirculation Pump	1	2	40%	24	32,675	KWH	\$ 0.07	\$ 2,287	\$207,370
Elec.	Digester Grinder Pump	1	3	40%	4	8,169	KWH	\$ 0.07	\$ 572	\$51,842
Elec.	Digester Blower Mixer	1	5	50%	12	32,675	KWH	\$ 0.07	\$ 2,287	\$207,370
Elec.	Piston Sludge Pump	2	2	40%	3	8,169	KWH	\$ 0.07	\$ 572	\$51,842
N.G.	Boiler Natural Gas Usage					2,289	MCF	\$ 7.33	\$ 16,778	\$1,521,193
Diesel	Diesel Fuel (Sludge Hauling)					900	GAL.	\$ 4.50	\$ 4,050	\$367,189
Subtotal									\$ 28,834	\$2,614,176

**TABLE 7. Energy Savings Analysis, Proposed Improvements
Pratt Wastewater Treatment Plant**

PROPOSED AEROBIC DIGESTER IMPROVEMENT, PRESENT FLOWS											
Energy	Description	Electric Motors				Annual Usage	Units	Cost per Unit	Present Annual Cost	40 year FV	
		No.	Hp	Efficiency	Hrs/Day						
Elec.	WAS Pumps	2	5	60%	0.21	948	KWH	\$ 0.07	\$ 66	\$6,018	
Elec.	Oxygen Generator	1	20	80%	7.2	49,012	KWH	\$ 0.07	\$ 3,431	\$311,055	
Elec.	Digester Grinder Pump	1	3	40%	1	2,042	KWH	\$ 0.07	\$ 143	\$12,961	
Elec.	Digester Sludge Recirc. Pump	1	15	55%	16	118,817	KWH	\$ 0.07	\$ 8,317	\$754,072	
Elec.	Rotary Lobe Pump Motors	2	7.5	80%	2.2	11,232	KWH	\$ 0.07	\$ 786	\$71,283	
Elec.	Submersible Mixers	2	4	100%	24	52,280	KWH	\$ 0.07	\$ 3,660	\$331,792	
Elec.	Belt Filter Press (2 Belt)	1	10	60%	2.2	9,984	KWH	\$ 0.07	\$ 699	\$63,363	
Diesel	Diesel Fuel (Sludge Hauling)					160	GAL.	\$ 4.50	\$ 720	\$65,278	
Subtotal									(computes to: 61.8% of existing operating cost)	\$ 17,822	\$1,615,821

PROPOSED AEROBIC DIGESTER IMPROVEMENT, FUTURE FLOWS											
Energy	Description	Electric Motors				Annual Usage	Units	Cost per Unit	Present Annual Cost	40 year FV	
		No.	Hp	Efficiency	Hrs/Day						
Elec.	WAS Pumps	2	5	60%	0.35	1,580	KWH	\$ 0.07	\$ 111	\$10,030	
Elec.	Oxygen Generator	1	10	80%	16	54,458	KWH	\$ 0.07	\$ 3,812	\$345,616	
Elec.	Digester Grinder Pump	1	3	40%	3	6,127	KWH	\$ 0.07	\$ 429	\$38,882	
Elec.	Digester Sludge Recirc. Pump	1	15	55%	18	133,670	KWH	\$ 0.07	\$ 9,357	\$848,331	
Elec.	Rotary Lobe Pump Motors	2	7.5	80%	4	20,422	KWH	\$ 0.07	\$ 1,430	\$129,606	
Elec.	Submersible Mixers	2	4	100%	24	52,280	KWH	\$ 0.07	\$ 3,660	\$331,792	
Elec.	Belt Filter Press (2 Belt)	1	10	60%	4	18,153	KWH	\$ 0.07	\$ 1,271	\$115,205	
Diesel	Diesel Fuel (Sludge Hauling)					260	GAL.	\$ 4.50	\$ 1,170	\$106,077	
Subtotal									(computes to: 73.7% of existing operating cost)	\$ 21,238	\$1,925,539