



**Pima County
Regional Wastewater
Reclamation Department**

**Program Management
CIP Improvements**

Alternative Delivery Study Energy Recovery Facility at Ina Road

**Pima County Regional
Wastewater Reclamation Department**

June 2009

**Alternative Delivery Study
Energy Recovery Facility**

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Executive Summary

The Energy Recovery Facility for the Ina Road Wastewater Reclamation Facility is to be constructed as part of the Ina Road Expansion and Upgrade project recommended in the Regional Optimization Master Plan dated November 2007. The Energy Recovery Facility utilizes as a prime fuel a renewable energy source, biogas, produced as a byproduct of the sludge stabilization process; and provides electrical and thermal energy to the Ina Road WRF. The Energy Recovery Facility will be connected to an electrical distribution system integrating all existing and expansion and upgrade power supplies including Tucson Electric and Power (TEP), the Energy Recovery Facility, and future additional renewable energy sources. Scheduled completion of the Energy Recovery Facility to provide power to the Ina Road Expansion and Upgrade project is critical. Delay of the Energy Recovery Facility construction could cause subsequent startup delays at the Ina Road Expansion and Upgrade project risking failure to meet ADEQ permit compliance.

PCRWRD and its consultant team evaluated a comprehensive range of delivery methods for the new Energy Recovery Facility. A workshop was held to determine which of the alternative delivery methods were applicable for the project. First, it was agreed that energy recovery is not a core business of the Pima County Regional Wastewater Reclamation Department (PCRWRD). Further, it was discussed what project costs are different for Design-Build (DB) or Design-Build-Operate (DBO) projects relative to conventional project delivery methods. Collaboration and cooperation between the design professional and construction contractor typically results in construction costs that are lower than they would be under traditional Design-Bid-Build (DBB) and Construction-Manager-At-Risk (CMAR). Therefore, use of DB or DBO as a delivery method provides more flexibility in assigning risk to the entity best suited or qualified to handle that risk. DBO provides more flexibility in assigning risk to the party best suited to manage that risk because it includes a long term operations component.

A Multiple Criteria Analysis was utilized and resulted in a recommendation of a Design-Build-Operate project delivery approach as the most cost effective delivery method for the County. The DBO method allows for effective involvement of operations staff in the design, and in developing and implementing effective predictive and preventive maintenance programs, and for operations and maintenance cost reductions through increased automation.

Preliminary discussions have been held with several DBO companies about this project. There is considerable interest by the DBO companies starting almost two years ago with the Request for Expression of Interest activities. More recently they have been waiting for the issuance of the Request for Qualifications (RFQ) for the last few months.

Changing the delivery method at this point will send a message to the marketplace of confusion and lack of commitment by the County to the project and to the procurement process. Switching from a DBO to another procurement approach has significant schedule implications because the schedule would be delayed to develop and issue a new solicitation with revised requirements and evaluation criteria. A major schedule impact is obtaining the air emission permits. The final selection of the biogas utilization equipment is necessary to complete the air emission permit application. Potential project delays could result in fines and penalty payments to the State for violation of permit discharge standards. The later any

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such decision is made, the greater its impact on the time available to procure and complete construction and commissioning of the new facility.

The PCRWRD currently intends to seek approval to issue the request for qualifications for the DBO procurement in July/August 2009. Shifting from DBO to another procurement approach prior to that time would result in a delay that would stress the schedule for project completion. The shift would result in at least an eight month extension to the project execution schedule. The completion of construction and commissioning of the Energy Recovery Facility project is necessary by late 2012 to coordinate with and support the onsite power needs of the Ina Road WRF Expansion Project, which is currently in the design phase, and to meet related regulatory deadlines.

It is recommended the County continue to send a clear message to the DBO community through its current course of action. Support for the DBO delivery method enabling PCRWRD to move forward with the best project teams with the best performance costs. The schedule for successful completion of the power project is at a critical point and it is imperative to begin the DBO procurement process immediately. Failure to act now will result in schedule delays, marketplace risks, and higher costs to the County.

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1.0 General

The project delivery approach for the Energy Recovery Facility project and the risks involved were examined in detail. Key considerations in the evaluation of the alternatives are that 1) biogas from the treatment process is a valuable renewable energy of sources, and 2) energy recovery is not a core business function of Pima County Regional Wastewater Reclamation Department. Further the existing energy recovery system infrastructure is near the end of its serviceable life and requires a major rehabilitation or replacement. These considerations were factored into project delivery approaches that were addressed in the following sections.

- Project Background
- Project Delivery Considerations
- Costs and Risks
- Project Delivery Recommendation
- Project Procurement Issues
- Conclusions

2.0 Project Background

The existing Energy Recovery Facility has provided reliable electrical service over its 30-year life, but the original engine-generator sets and associated power distribution equipment are near the end of their useful life. As part of the Regional Optimization Master Plan (ROMP) the Energy Recovery Facility (Powerhouse) was scheduled to be refurbished or replaced.

Since biogas is a valuable asset, one goal of the Pima County Regional Wastewater Reclamation Department (PCRWRD) is to efficiently utilize the available biogas energy from the digesters. A second goal is to furnish a modern, electrical power supply system to the Ina Road WRF capable of providing reliable service into the foreseeable future.

In 1977, Pima County opened a new Water Pollution Control Facility near Ina Road and Interstate I-10. From commencement of operations the Ina Road facility has met all or a portion of its electric power needs through on-site energy recovery using Waukesha engine-generator packages (650 kW each) with an ebullient-cooled, co-generation system that produces both heat and electricity. Currently, six of the facility's seven Waukesha engine/generator units use the original blocks and crankshafts installed in 1977.

Engine generated thermal energy is used by onsite digesters to produce digester gas (methane) that is consumed as fuel by the engines. There are three fuels – digester gas, natural gas, or propane – available on site. Propane is provided for emergency back-up and is rarely used to operate the engines. Digester gas (biogas) produced by the digesters is utilized first, followed by natural gas to meet the facility's electrical/thermal demands.

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Originally the existing Energy Recovery Facility furnished all the electrical and thermal needs of the High Purity Oxygen wastewater treatment facilities and the attendant operations. The generated power was at 4.16 kV for distribution and utilization. With the recent addition of the Biological Nutrient Removal Activated Sludge (BNRAS) wastewater treatment system additional electrical energy was required and provided through a dedicated service from the local commercial electrical utility (Tucson Electric Power), while the existing Energy Recovery Facility continued to serve the older sections of the plant. The two power sources are kept separate because equipment to integrate and synchronize the two power sources was not provided.

For co-generation the system uses heat from the engine's exhaust and water jacket in an ebullient cooling (literally, "boiling water") system. Boiler water is pumped through the engines' water jackets, then routed back through the boiler and passed through the exhaust heat exchangers. The thermal energy in the water is used to provide heat to HVAC systems for space heating, chilled water for space cooling, domestic hot water, and heated process water to heat sludge in the digesters.

During cool weather heat energy from the engines is used to provide space heating of several structures onsite through a hot water loop. During hot weather the heat energy is utilized in an absorption chiller to produce chilled water for space cooling of onsite structures through a chilled water service piping system.

On July 5, 1977 the first engine/generator unit went on line. On September 26, 2001, the engines reached a milestone by surpassing one million operating hours. With seven engines, the operational staff can keep five running fairly constantly, with one in reserve, and with one undergoing routine maintenance. Sometimes the energy recovery operation must use six engines. The engine-generator's output averages over 2.5 MW of electricity plus thermal energy output. The energy recovery system produces a little over 3.5 million kW a month in both thermal and electrical loads. In general, the Waukesha engine-generator sets have provided good service over the life of system, but they are near the end of serviceable life and need replacement.

Observations of other concerns and deficiencies of the existing facility and operations are:

- Existing switchgear servicing the generator sets is not of modern design and is not set up to synchronize load with the local utility.
- Space for expansion of the existing electrical gear to include synchronistic operations with the local utility is very limited.
- Air emission equipment on the existing generator sets are grandfathered into "old" less stringent air emissions standards and do not comply with modern requirements. To upgrade the air emissions equipment with the existing equipment arrangement, the additional equipment would need to be located on the roof, which would require significant reinforcement.
- With the major upgrades to the system required, there are number of building code modifications that will be required to bring the facility into compliance with modern codes.
- With major upgrades required to replace the existing systems and modifications to meet current building codes there will be considerable coordination of new work while maintaining existing operations in service.
- There are concerns whether the existing structure will accommodate the number, make, and model of the new equipment available in the marketplace to best meet the needs of the plant.

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- Because of the past operating service, the existing structure may need structural reinforcement for continued service.

Based on above concerns and issues of the existing building functionality and structural integrity, it is believed that the investment to retain and modify the existing structure in power generation service would be more costly than the value of the building. It is recommended that the new system equipment be housed in new structures most suitable for its service and that the existing structure be decommissioned. The new facility would be located on the vacant site adjacent the existing Energy Recovery Facility.

Despite the age of the power generation equipment it should be recognized that the existing power generation equipment may have some salvage value in an open market. This salvage value can be utilized to reduce the capital costs of new the facilities. Further, while no longer suitable to house power generation equipment, the existing structure may have an adaptive reuse, such as for a warehouse facility. Issues of structural integrity for new use and code issues would need to be addressed as part of a reuse evaluation.

The future operations at the Ina Road will centralize the sludge treatment and handling operations of both Ina Road WRF and the Roger Road WRF. The centralized facilities are scheduled to start-up in mid-2014. At that time the biogas production at the Ina Road WRF will increase from 270,000 to 330,000 cubic feet per day to 550,000 to 820,000 cubic feet per day. Therefore, the new Energy Recovery Facility will need to be sized to utilize the total volume of biogas generated when the centralization of sludge treatment and handling is complete.

3.0 Project Delivery Considerations

Initial examination of the Ina Road Energy Recovery Facility Project potential project delivery methods included the following.

1. Design-Bid-Build (DBB)
2. Design Build (DB)
3. Design Build Finance (DBF)
4. Construction-Manager-at-Risk (CMAR)
5. Design Build Operate (DBO)
6. Design Build with Separate Operations Contract (DB+O)
7. Design Build Maintain (DBM)
8. Design Build Finance Operate (DBFO)
9. Design Build Finance Own Operate (DBFOO)

The first four methods are considered short term options in that the contractual relationship with the Company providing the cogeneration facility ends after the project has been constructed and accepted. Options 5 to 9 are long term options in that a contractual relationship is maintained for an operating period of 10 to 20 years following completion and acceptance of the facility.

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Based on discussion and preliminary screening of available options at the November 12, 2008 workshop on the Energy Recovery Facility, two of the short term options (CMAR and DB) and two of the long term options (DBO and DBFO) were carried forward for the Multiple Criteria Analysis (MCA).

Among the short term options, the County has had success with CMAR and prefers it to DBB since it offers construction contractor inputs before final pricing and shortens the procurement process schedule. DB provides a short term option in which the County could choose to allocate some of the project risks to another party and that also offers the potential for further cost and time savings. A comparison of DBO and DBFO among the long term options provides an evaluation of the advantages and disadvantages of using private financing. DBO provides the County an opportunity to turn over the power production function and responsibilities to another party so that the County can focus its attention on the core function of treating wastewater. DBFO provides the benefits of a DBO procurement and avoids any cash outlays until the project is completed and accepted. This could allow the project to move ahead more quickly if the County's ability to finance the project were to cause a delay. Generally, the cost of private financing is generally more costly than with County bond funds.

DB + O was eliminated because having a separate company responsible for operations negates the advantage of operator involvement in the DBO process where the Company providing the facility must also operate the facility for 15 to 20 years, an inherent safeguard against poor quality equipment being provided. DBM was eliminated because having the Company responsible for maintenance and the County responsible for operation could lead to uncertainty about which party is responsible when problems occur (poor operational techniques versus inadequate maintenance). DBFOO was eliminated because of concerns about the regulatory challenges of private ownership. Under DBFOO, the company owning the cogeneration facility and furnishing electricity to the plant could be considered a Public Service Corporation and become a regulated utility with the attached regulatory administration and compliance burden added to the cost of operation.

Various criteria were determined to evaluate the four delivery methods (CMAR, DB, DBO, and DBFO). **Table 1** shown below lists the criteria and criteria definitions used to evaluate the four alternative delivery methods.

**Alternative Delivery Study
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Multiple Criteria Analysis Criteria and Definitions**

Criteria	Definition
Optimize Risk Allocation	How the procurement model effectively allocates risk to the party best able to manage that risk and the County's ability to enforce that risk allocation.
Project Quality and Asset Management	How the procurement model can impact the long term quality of the asset including opportunities in the procurement method for innovation in design, construction or program delivery.
Implementation Schedule	How the procurement model affects the implementation schedule.
Regulatory Compliance	How the Project's ability to comply with regulations and permitting requirements is impacted by the procurement model.
Sustainability	How the Project's ability to be sustainable over the long term is impacted by the procurement model.
Staffing Considerations	How the County's staffing requirements are impacted by the procurement model.
Level of County Control	The ability of the County to exercise control during the procurement process under consideration.
Market Viability	Assessment of the market conditions to determine the likelihood that the procurement method would result in a process that is competitive.
Flexibility	The flexibility to accommodate future regulation changes and other capital or operational changes.
Cash Flow	The timing of County cash outlays to fund the project.
Cost – Present Value	The probable present value of capital and O&M costs.
Predictability of Costs	The potential for project costs to increased during design, construction, and operation.
Fiscal and Legal Complexity	Legislative, legal, or fiscal considerations of the application of the various procurement models.

Descriptions the comparisons for each delivery methods with each of the criteria were compiled and are provided in the Appendix at the end of this study report.

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4.0 Costs and Risks

Every project regardless of project delivery has associated costs and risks. Various studies have compared how project costs change for Design-Build (DB) or Design-Build-Operate (DBO) projects relative to conventional project delivery methods. For example, in their comparison of costs for buildings research, Sanvido and Konchar¹ found that the use of DB provided an average of 6 percent reduction in unit construction costs with a 99 percent level of certainty when compared to conventional procurements. The balance of costs versus risks is a key component in selecting the optimal delivery method for a project. The following discusses risks and costs associated with selecting a project delivery method.

4.1 Capital Costs

Costs associated with alternative project delivery models are adjusted to reflect inherent differences in the way projects are delivered under each method, including the costs of risks. Primarily, differences stem from the increased level of collaboration under the alternative delivery models between the different parties involved in the delivery of the project. This is often expressed as project efficiency.

When evaluating procurement models, an adjustment is made to project costs based on the potential for a particular procurement method to be more cost effective, or efficient. This efficiency adjustment is typically applied as a percentage reduction, and is determined based on a detailed assessment of a project's unique elements, relative to specific attributes of a particular procurement model.

For example, a design-build-operate procurement model requiring project company to competitively bid a fixed price for long term maintenance, subject to indexing, will provide a strong incentive to secure the best possible pricing on supplies.

Specifically, under the DB or DBO model, collaboration and cooperation between the design professional and contractor typically results in construction costs that are lower than they would be under traditional DBB and Construction-Manager-At-Risk (CMAR). For the purposes of this analysis it was assumed that the greater level of collaboration and cooperation under DB or DBO would result in design and construction costs that were 5% lower than the costs under conventional methods (CMAR). The 5% value is a conservative value based on studies showing savings well in excess of this value. Similarly, for models that involve contract operations of the facility, the input from the operator during design and construction serves to reduce construction costs even further by the close collaboration of the project team.

4.2 Operation and Maintenance Costs

Operation and maintenance (O&M) costs are those expenses associated with the day-to-day operation of the Energy Recovery Facility project, once construction is completed.

¹ Sanvido, V. and Konchar, M., "Selecting Project Delivery Systems," Project Delivery Institute, State College, PA (1999).

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Some of the reasons for O&M costs reductions in a DBO project delivery are incentives included in the contract performance and costs guarantees, which are:

- Investments in automation and control systems that allow a reduction in staff.
- More aggressive and effective use of predictive maintenance and preventative maintenance programs
- Utilization of streamlined procurement rules to reduce procedural costs of operation.
- Oftentimes can bring regional or nationwide buying power to lower costs of procuring materials and supplies.
- Employment and enforcement of effective work rules and procedures.
- Optimization of the inventory of spare parts. Excess inventory ties up funds and creates costs for space and labor to manage. Inadequate inventory leads to emergency purchases at high cost.

With a modern power generation facility there is no need for 24-hour monitoring and maintaining of the system. This would result in a significant reduction in staff over current operations. If the facility is operated by a third party, it is most likely to be highly automated and staffed part time. The labor requirements under a DBO project delivery would be set to that no current employee would lose his or her job, nor be demoted to lower pay, benefits or responsibilities. The DBO Company would be required to hire some of the current staff, if that staff would volunteer to transfer to the Company, and others would be transferred within the County. The labor requirements also provide safeguards against the solicitation by the Company of County employees over the term of the contract.

4.3 Renewable Energy Credits and Grants

According to the commercial power utility, Tucson Electric Power (TEP), as an owner of a new energy recovery facility that operates on a renewable fuel source (biogas), the County will be eligible for the TEP Renewable Energy Credit Purchase Program (RECPP). This program provides incentives for affordable, environmentally sensitive, customer-sited renewable energy generation systems to supplement TEP customer's energy needs. The RECPP offers incentives in 10, 15 and 20 year Renewable Energy Credits (REC) Agreements for renewable energy systems including combined heat and power (thermal and electric). The incentives would offset a portion of the operations and maintenance cost of the facility. There is a potential for substantial savings to the County through the RECPP. The RECs would accrue to the owner regardless of whether the County or third party operator runs the facility.

Pima County Facilities Management is assisting the Regional Wastewater Reclamation Department in seeking grants. RWRD, through Facilities Management, has been in the process of seeking funding under Statutory Authority of the American Recovery and Reinvestment Act 2009, Public Law 111-5 (Recovery Act). If the County is eligible for the grants and the conditions of acceptance are favorable to the County, the grants would reduce the overall capital costs outlay of the facility by the County. The grants would be issued to the owner of the facility whether operated and maintained by the County or a third party.

4.4 Risks

Using a conventional DBB method, there is a risk associated with hiring the low bid contractor without the ability to base selection on qualifications. The County warrants the design to the construction

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contractor although the County has recourse against the design professional for negligence. The construction contractor is not responsible for any operational problems at the facility. Unlike some of the other methods, there is no guarantee that the project will work as intended, either upon completion of construction or over the long term operating period. In these models, the County will typically retain most risks associated with design and construction of the facilities over the long term. Typically, the design professional and contractor provide bonding and insurance; however, the County's ability to collect under these protective measures can take time and involve extra costs such as legal fees with no guarantee of payment.

Use of DB or DBO as a delivery method provides more flexibility in assigning risk to the entity best suited to handle that risk. Contract provisions and technical specifications define allocation of risk using performance based requirements. Design liability for plant construction is transferred to the contractor over the short term. The County will retain risk associated with design and construction over the long term (after warranty period). After construction, the County is fully responsible for long term operation and maintenance of the plant.

DBO provides more flexibility in assigning risk to the party best suited to manage that risk because the model now includes a long term operations component. The contracted DBO entity guarantees the quality and effectiveness of the facility upon completion and also over the long term operating period. Design liability for construction and performance is transferred to the DBO entity. Since this model does not include financing, the County must rely on contract language and parental company guarantees to enforce the risk transfer. Enforcement of risk transfer may involve extra costs for the County (i.e. legal fees). Importantly, DBO provides a single source of responsibility for the plant construction and operation. While in DB, there may be disputes over who is responsible for problems that arise in the completed plant that can lead to litigation, in DBO the responsibility clearly lies with the DBO contractor.

4.5 Marketplace Risk Issues

The DB and DBO vendor market is generally comprised of large or national firms / companies. While the Energy Recovery Facility and other projects identified in the ROMP have generated considerable interest among the DB and DBO vendor communities, there are other projects with which the County must compete in order to retain the interest of the most qualified firms. The preparation of a proposal in response to a request for proposals required a substantial investment and commitment from each proposing entity. While A.R.S. Title 34 requires the County to pay an honorarium to firms submitting an unsuccessful, but otherwise responsive proposal in response to a request for proposals, the amount of the honorarium only serves as partial compensation for the real costs associated with the preparation of a Proposal. DB and DBO vendors are therefore extremely careful in determining which projects to pursue and at what level of effort. It is therefore critical to the success of any procurement that the County send a clear message to prospective vendors that it intends to move forward with a project in accordance with its stated course of action should it receive a proposal that meets its cost and scope expectations.

Preliminary discussions have been held with several DBO contractors about this project. There is considerable interest by the DBO contractors' community and they have been awaiting the issuance of the Request for Qualifications (RFQ) for the last few months. A determination to change course from finalizing and issuing the DBO RFQ by either attempting to incorporate an alternative to DBO or by abandoning the current DBO procurement in favor of an alternative procurement would risk signaling to

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the marketplace that the County is uncertain as to its intended course of action. This uncertainty may result in qualified firms determining not to pursue the project for the reasons indicated above or in firms expending less effort in pursuing the project, potentially resulting in less competition overall and in lower quality proposals from those firms that determine to proceed. These factors would likely result in higher project costs and overall project delay.

PCRWRD has established a sound framework for the implementation of the Energy Recovery Facility project on a DBO basis through the studies of project delivery methods conducted in connection with the ROMP and the issuance of a request for expression of interest to the vendor community concerning the various project delivery methods. As indicated above, the PCRWRD determined through these efforts that DBO would be the most cost-effective delivery method for the Energy Recovery Facility project. The PCRWRD has positioned the project for the market sector that it believes will provide the best return on costs to the County.

5.0 Project Delivery Recommendation

The project was evaluated based on the factors of schedule, costs, risk and marketplace. Each of the criteria identified in Section 2 was given a weight from 1 to 10 with 10 being extremely important. For example, 'Flexibility' which has a rank of 3 has less importance or weight than 'Cost – Present Value' which has a weight of 10. The criteria were then ranked for each delivery method from 1 to 10 with 10 being excellent. For example, under the criteria 'Fiscal and Legal Complexity' DBO has a rank of 9 which is near excellent while DBFO has a rank of 3 indicating DBO is much less fiscally and legally complex than to DBFO. The rank and weight were then multiplied to give the weighted rank for each delivery method criteria. These weighted ranks were then summed to give a final weighted rank total. The alternative delivery method with the highest weighted rank total is considered the best of these options according to this Multiple Criteria Analysis.

Table 2 – Multiple Criteria Analysis Scoring Table showing criteria weight, criteria ranking and scoring calculations for each delivery method, and weighted rank totals is below.

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Table 2
Multiple Criteria Analysis Scoring Table

Pima County Energy Recovery Facility		Ranking				Scoring Calculation			
Scoring Criteria	Weight	CMAR	DB	DBO	DBFO	CMAR	DB	DBO	DBFO
Optimize Risk Allocation	8	2	6	8	10	16	48	64	80
Project Quality and Asset Management	10	6	6	8	8	60	60	80	80
Implementation Schedule	6	5	10	10	9	30	60	60	54
Regulatory Compliance - Air Permits	10	8	8	9	9	80	80	90	90
Sustainability	4	7	6	7	7	28	24	28	28
Staffing Considerations	4	6	6	9	9	24	24	36	36
Level of County Control	4	10	8	6	6	40	32	24	24
Market Viability	6	10	9	9	7	60	54	54	42
Flexibility	3	10	8	6	6	30	24	18	18
Cash Flow	10	5	5	5	10	50	50	50	100
Cost - Present Value	10	7	8	9	6	70	80	90	60
Predictability of Costs	6	4	6	8	8	24	36	48	48
Fiscal and Legal Complexity	6	10	9	9	3	60	54	54	18
Weighted Rank Totals						572	626	696	678

Ranking: 1 to 10 with 10 being excellent

Weight: 1 to 10 with 10 being extremely important

Based on the results of the MCA Scoring Table, the order from best to worst delivery method for the Energy Recovery Facility Project is DBO, DBFO, DB, and CMAR. Thus, DBO was selected as the delivery method for the Energy Recovery Facility project and scheduling and procurement document preparation for the DBO delivery method has been carried forward.

6.0 Project Procurement Issues

Switching from a DBO to an alternative procurement has schedule implications because of the need to develop and issue a new solicitation with revised requirements and evaluation criteria. The later any such decision is made, the greater its impact on the time available to conduct the procurement and complete construction and commissioning of the new facility. The PCRWRD currently intends to seek approval to issue the request for qualifications for the DBO procurement in July 2009. Shifting from DBO would result in a delay that would stress the schedule for project completion, as such would add eight or more months to the procurement schedule. The completion of construction and commissioning of the Energy Recovery Facility is necessary by late 2012 to coordinate with and support the onsite power needs of the Ina Road WRF Expansion Project, which is currently in the design phase, and to meet related regulatory deadlines.

The requirements and considerations that go into selecting a DBO are different from those that go into selecting alternative project delivery approaches. For one example, the operator's presence in the DBO team ensures a reasonable measure of quality in the resulting project because the operator will have to operate and maintain the facility for a period of 15 to 20 years for a fixed price at a guaranteed level of

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performance. As a general matter, if it costs more for the DBO to operate the facility than the DBO receives through its fixed O&M fee, the DBO is responsible for the excess costs. As such, the successful DBO has an incentive to design and build a cost effective facility that will enable it to meet its performance guarantees within the fixed O&M fee for the term of the contract. Conversely, a DB has no such long-term performance incentive, so the County's quality and maintenance requirements would have to be developed and spelled out in detail, always mindful of the potential that the County's minimum requirements, will be the DB's maximum requirements.

There are concerns that the Board could raise its concerns at any time by placing the procurement on the agenda. A.R.S. Title 34 stipulates that only the names of the firms selected to receive a request for proposal may be disclosed to the public before the contract is executed. As a result, we believe that substantive discussions with the Board regarding the procurement after receipt of statements of qualifications and before execution of the contract would likely have to be held in executive session.

7.0 Conclusions

PCRWRD and its consultant team evaluated a comprehensive range of project delivery methods for the new Energy Recovery Facility project at Ina Road. Taking into account that energy recovery is not a core function of wastewater treatment the DBO delivery method was selected based on a weighted rank assigned in a Multiple Criteria Analysis. The DBFO delivery method was eliminated due to the complex nature of financing the project with private funds within the County.

The DBO project delivery offers cost savings compared to conventional project delivery methods, as well as the opportunity for risk transfer. Design professionals, construction contractors and operators with experience in constructing and operating power generator systems will collaborate to provide a system with the best life cycle costs. The critical distinctions among alternative project delivery approaches were evaluated to support that the DBO is the most cost-effective delivery method for the new Energy Recovery Facility project at Ina Road.

As a general matter, DBO has the potential to provide greater cost savings over alternative project delivery approaches due to the efficiencies associated with operator-driven team collaboration under the DBO with an emphasis on life-cycle costs. DBO also offers a greater opportunity for risk transfer than DB because the DBO entity assumes long-term operation and maintenance responsibility for the constructed asset. While the short term options responsibility for the asset terminates with "acceptance" of the asset (subject only to normal warranties of construction), the DBO entity's responsibility extends for the entire long term life of the contract during which the DBO entity must guarantee performance for a fixed service fee. This guarantee of performance means that the DBO entity is responsible for any fines or penalties associated with a failure of performance or regulatory compliance. The DBO entity also bears the critical risk that, absent the occurrence of contractually defined uncontrollable circumstances, if it costs more to operate and maintain the facility than the fixed service fee, the DBO is responsible for the cost overruns. This risk transfer has a value to the County that must factor into the overall determination of which delivery method is most cost-effective.

A DBO is suitable for PCRWRD's Energy Recovery Facility project because the power generating is not a core business for the department and relinquishment to an outside company will allow the department to focus on wastewater collection and treatment. Further, there are the potential costs savings in operations

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of the facilities by a third party expert in these systems. Because of scheduling of certain project required elements, it is imperative this project be advertised July 2009.

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APPENDIX A

Multiple Criteria Analysis Table

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Appendix

Multiple Criteria Analysis Summary Table

Criteria	CMAR	DB	DBO	DBFO
Optimize Risk Allocation	<p>There is risk associated with hiring the low bid contractor without ability to base selection on qualifications. The County warrants the design to the construction contractor. If there are operational problems, the construction contractor is not responsible; the County only has a negligence claim against the design engineer.</p> <p>No single party guarantees that the project will work as intended, either upon completion of construction or over the long term operating period.</p> <p>In this model, the County typically retains most risks associated with the design and construction of the facility for the long term. Typically the designer and contractor provide bonding and insurance (i.e. E&O); however the County's ability to collect under these protective measures can take some time and involve extra costs, such as legal fees.</p>	<p>Provides flexibility in assigning risk to the party best suited for that risk. Contract provisions and technical specifications define the allocation of risk using performance-based requirements. The absence of professional negligence is not an excuse if construction problems occur. Design liability for Project construction is transferred to the contractor. The contractor guarantees the project will work as intended during an acceptance test after substantial completion, but not during operations.</p> <p>The County retains the risks associated with design and construction over the long term (typically the risk can be transferred initially to the DB contractor for the warranty period only).</p> <p>The County is fully responsible for long term operations and maintenance for the Project.</p>	<p>Provides flexibility in assigning risk to the party best suited for that risk. Contract provisions and technical specifications define the allocation of risk using performance-based requirements. DBO contractors guarantee the project will work upon completion and also over the long term operating period.</p> <p>The absence of professional negligence is not an excuse if problems occur. Design liability for construction and performance is transferred to the contractor.</p> <p>Since this model does not include financing, the County must rely on contract language and parental company guarantees to enforce the risk transfer. Enforcement of risk transfer may involve extra costs for the County (i.e. legal fees).</p> <p>This model is dependent on performance based payments; if the contractor does not perform, the County does not pay for the services.</p>	<p>Provides flexibility in assigning risk to the party best suited for that risk. Contract provisions and technical specifications define the allocation of risk using performance-based requirements. DBFO contractors guarantee the project will work upon completion and also over the long term operating period. The absence of professional negligence is not an excuse if problems occur. Design liability for construction and performance is transferred to the contractor.</p> <p>A consortium is typically led by the operating partner who injects capital into the deal. This instills an owner-like responsibility for managing risks into the operator without the actual transfer of ownership.</p> <p>The County does not pay for the Project (Capital Costs) until it is operational, and only when it is operating in accordance with the performance specifications.</p> <p>This model is dependent on performance based payments; if the contractor does not perform, the County does not pay for the services. Depending on the performance, the contractor may even forfeit some of the capital repayments.</p>

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Appendix

Criteria	CMAR	DB	DBO	DBFO
<p>Project Quality and Asset Management</p>	<p>County selects all aspects of design, will be in control of making selections that will assure compliance and will control the operation. There is risk associated with hiring the low bid contractor without ability to base selection on qualifications.</p> <p>The County self-performs long term maintenance and may be prone to deferring maintenance under budgetary pressure.</p> <p>Under the conventional system, the County is only given one design. This design has not been "market-tested" to ensure that it is the most innovative and flexible solution.</p>	<p>A of 104 public sector DB projects found owner satisfaction to be excellent. Another of 351 projects found that owner satisfaction was better for DB projects than for DBB projects.</p> <p>Under this model, the County is responsible for creating output specifications used during the procurement process. In response to the RFP, the County will have the pick of three designs that comply with the specifications.</p> <p>Greater risk of poorer quality equipment with higher maintenance requirements because the DB contractor has no ongoing obligations related to O&M.</p> <p>Under this scenario, the County has the ability to choose from three designs. The designs were created in a competitive market and would likely result in a more innovative and flexible design.</p>	<p>Adding the "O" to DB has been shown to typically provide additional savings through operator input to design, application of knowledge from national pool of experts in operating company to operating issues and more efficient operation.</p> <p>Contractor selection can be based heavily on qualifications reducing the chances inherent that a low-bidding, marginally qualified contractor may win the contract. Improved designs can result when proposers have to submit a 25% design with fixed costs in competition with other parties. There is competition as to design, construction and operations and maintenance. Requires collaboration among the designer, builder and operator.</p> <p>Under this model, the County is responsible for creating output specifications used during the procurement process. In response to the RFP, the County will have the pick of three designs that comply with the specifications.</p> <p>The County also creates operating specifications that the contractor must meet in order to be paid. The specifications involve the operations of the Project as well as the required level of maintenance during the operating period and asset condition of the Project when and if it is turned over to the County.</p>	<p>The equity partner in a DBFO will manage life cycle costs effectively to minimize long term risks.</p> <p>In a DBFO, the operating partner typically injects equity into the project. Contractor selection can be based heavily on qualifications reducing the chances that a low-bidding, marginally qualified contractor may win the contract. Improved designs can result when proposers have to submit a 25% design with fixed costs in competition with other parties.</p> <p>There is competition as to design, construction and operations and maintenance. Requires collaboration among the designer, builder and operator.</p> <p>Under this model, the County is responsible for creating output specifications used during the procurement process. In response to the RFP, the County will have the pick of three designs that comply with the specifications.</p> <p>The County also creates operating specifications that the contractor must meet in order to be paid. The specifications involve the operations of the Project as well as the required level of maintenance during the operating period and asset condition of the Project when and if it is turned over to the County.</p> <p>County can withhold capital repayments during the final years of the term to ensure that the Project is in a good condition at the end of the term.</p>

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Criteria	CMAR	DB	DBO	DBFO
Project Quality and Asset Management- <i>Continued</i>			<p>Under this scenario, the County has the ability to choose from three designs. The designs were created in a competitive market and would likely result in a more innovative and flexible design.</p> <p>There is an added element with this model whereby the inclusion of operations would likely result in a more innovative design (i.e. longer period of time for the operator to realize return from the innovation).</p>	<p>Under this scenario, the County has the ability to choose from three designs. The designs were created in a competitive market and would likely result in a more innovative and flexible design.</p> <p>There is an added element with this model whereby the inclusion of operations would likely result in a more innovative design (i.e. longer period of time for the operator to realize return from the innovation).</p>
Implementation Schedule	The CMAR model has the longest implementation schedule once the procurement model is chosen.	A of 351 projects found DB to deliver projects 33% faster than DBB and 23% faster than CMAR because design and construction occur concurrently. Shorter project schedule can provide savings by reducing effects of inflation and reduced interest during construction.	DBO projects have similar schedule impacts as DB.	<p>DBFO may offer added financial leverage to encourage compliance with project schedule.</p> <p>There is a steep learning curve associated with evaluating and approving contract execution.</p> <p>The inclusion of financing also adds a level of complexity to the deal.</p>

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Criteria	CMAR	DB	DBO	DBFO
Regulatory Compliance	<p>County selects all aspects of design, will be in control of making selections that will assure compliance and will control the operation.</p> <p>The County uses its normal permitting procedures and retains the control and responsibility for the project non-construction and operating permits. Although the County may wish to retain the control and responsibility for obtaining the air permits, the alternative methods allow the County to transfer the responsibility for virtually all other permits to the contractor.</p>	<p>County will be responsible for and control operation and will select a proposal that will be designed to meet specified performance standards and regulatory requirements. Acceptance testing ensures that the facility meets regulatory and performance requirements prior to the County taking control of the operation of the Project.</p> <p>Although the County may wish to retain the control and responsibility for obtaining the air permits. DB allows the County to transfer the responsibility for virtually all other permits to the contractor.</p>	<p>The Service Agreement transfers the risk associated with technology and Project operations to the contractor while requiring the operator to meet all regulatory requirements during the long term contract operations period. Failure to meet these requirements results in liquidated damages, an obligation to pay regulatory fees and penalties and, depending on the severity of the non-compliance and number of circumstances, may result in an operator default.</p> <p>Although the County may wish to retain the control and responsibility for obtaining the air permits. DBO allows the County to transfer the responsibility for virtually all other permits to the contractor.</p> <p>This model includes financial incentives for the operator to comply.</p> <p>There is operator input during the design, which improves operating and compliance.</p> <p>The County is able to apply penalties to the operator independently from the Regulator. If fines are assessed, the operator may be required to pay the fines as well as payment penalties assigned by the County.</p>	<p>The Service Agreement transfers the risk associated with technology and Project operations to the contractor while requiring the operator to meet all regulatory requirements during the long term contract operations period. Failure to meet these requirements results in liquidated damages, an obligation to pay regulatory fees and penalties and, depending on the severity of the non-compliance and number of circumstances, may result in an operator default.</p> <p>Although the County may wish to retain the control and responsibility for obtaining the air permits. DBFO allows the County to transfer the responsibility for virtually all other permits to the contractor.</p> <p>This model includes financial incentives for the operator to comply.</p> <p>There is operator input during the design, which improves operating and compliance.</p> <p>The County is able to apply penalties to the operator independently from the Regulator. If fines are assessed, the operator may be required to pay the fines as well as payment penalties assigned by the County.</p>

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Criteria	CMAR	DB	DBO	DBFO
Sustainability	<p>County selects all aspects of design and will be in control of making selections that will maximize sustainability.</p> <p>If the County decides to seek LEED certification for the Project, the County will be responsible for all documentation required for that certification.</p>	<p>County can establish sustainability requirements in the RFP such as achieve LEED gold certification within one year of operation and can transfer the risk associated with achieving these requirements to the private sector. The private sector partner manages the paperwork and certification process to achieve this requirement.</p> <p>The DB contractor has less sustainability incentives in equipment choices because the contractor is not involved in ongoing O&M.</p>	<p>County can establish sustainability requirements in the RFP such as achieve LEED gold certification within one year of operation and can transfer the risk associated with achieving these requirements to the private sector. The private sector partner manages the paperwork and certification process to achieve this requirement.</p>	<p>County can establish sustainability requirements in the RFP such as achieve LEED gold certification within one year of operation and can transfer the risk associated with achieving these requirements to the private sector. The private sector partner manages the paperwork and certification process to achieve this requirement.</p>
Staffing Considerations	<p>County provides staff to monitor design.</p> <p>County staff fully responsible for operation. The County must deal with eventually addressing vacancies resulting from an aging workforce entering retirement.</p> <p>The County self-performs long term maintenance and may be prone to deferring maintenance under budgetary pressure.</p> <p>The County will be responsible to provide sufficient staff for Project operations and maintenance over the long term.</p>	<p>Requires intensive up-front involvement by County staff and a team of advisors to define the project specifications, structure the procurement documents and evaluate the proposals. Once the contract has been signed, the monitoring of the design and construction are the principal County activities. Because the County would not be doing the design in-house, the net effect on the number of County staff is not likely to be significant during design and construction.</p> <p>County fully responsible for operation. The County must deal with eventually addressing vacancies resulting from an aging workforce entering retirement.</p> <p>The County self-performs long term maintenance and may be prone to deferring maintenance under budgetary pressure.</p> <p>The County will be responsible to provide sufficient staff for Project operations and maintenance over the long term.</p>	<p>Requires intensive up-front involvement by County staff and a team of advisors to define the project specifications, structure the procurement documents and evaluate the proposals. Once the contract has been signed, the monitoring of the design and construction are the principal County activities. Because the County would not be doing the design in-house, the net effect on the number of County staff is not likely to be significant during design and construction.</p> <p>The contractor provides the operating staff and during operations the County involvement is reduced to oversight of the contract operations.</p> <p>The private operator is responsible to provide sufficient staff for Project operations and maintenance over the long term.</p> <p>Effort is required to insure successful transition of existing staff to the private operator.</p>	<p>Require intensive up-front involvement by County staff and a team of advisors to define the project, structure the procurement documents and evaluate the proposals. Once the contract has been signed, the monitoring of the design and construction are the principal County activities. Because the County would not be doing the design in-house, the net effect on the number of County staff is not likely to be significant during design and construction.</p> <p>The contractor provides the operating staff and during operations the County involvement is reduced to oversight of the contract operations.</p> <p>The private operator is responsible to provide sufficient staff for Project operations and maintenance over the long term.</p> <p>Effort is required to insure successful transition of existing staff to the private operator.</p>

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Criteria	CMAR	DB	DBO	DBFO
Level of County Control	<p>County controls all details of design.</p> <p>Offers the highest degree of County control but with a higher degree of risk.</p>	<p>Allows the County to determine the degree of control and risk that it wishes to maintain. Many of the potential advantages can be realized only if County is willing to reduce the degree of control of the details of the design that it normally exercises using CMAR.</p> <p>The County controls the design and construction of the project through the output specification drafting process.</p>	<p>Allows the County to determine the degree of control and risk that it wishes to maintain. Many of the potential advantages can be realized only if County is willing to reduce the degree of control of the details of the design and direct operational responsibility that it normally exercises using CMAR.</p> <p>The County controls the design, construction, and operations/maintenance of the project through the output specification drafting process.</p>	<p>Allows the County to determine the degree of control and risk that it wishes to maintain. Many of the potential advantages can be realized only if County is willing to reduce the degree of control of the details of the design and direct operational responsibility that it normally exercises using CMAR.</p> <p>The County controls the design, construction, and operations/maintenance of the project through the output specification drafting process.</p>
Market Viability	<p>The County has more experience with CMAR than with the alternative methods. CMAR is the most widely used delivery method by the County and would probably generate the most competition for construction.</p>	<p>Significant number of companies is in the Design Build market. Will require development of new procurement documents, procedures and contract forms.</p> <p>The County may wish to retain an advisor to manage the procurement including development of the documents and procedures.</p>	<p>Because of the smaller number of companies currently in the "O" market, there will probably be less competition for DBO than for DB.</p> <p>Will require development of new procurement documents, procedures and contract forms. The County may wish to retain an advisor to manage the procurement including development of the documents and procedures.</p>	<p>Because of the limited number of companies currently in both the "O" and "F" markets, there will probably be less competition for DBFO than for DB or DBO</p> <p>Will require development of new procurement documents, procedures and contract forms. The County may wish to retain an advisor to manage the procurement including development of the documents and procedures.</p>
Flexibility	<p>The County is in control of any construction or operational changes after the initial construction is complete and can unilaterally decide to make a change subject only to regulatory or utility approval.</p>	<p>The County is in control of any construction or operational changes after the initial construction is complete and can unilaterally decide to make a change subject only to regulatory or utility approval.</p>	<p>The County must negotiate with the contractor to make County-desired or regulatory or utility driven changes.</p> <p>The County will have to negotiate with the contractor on the costs for capital improvements and O&M service fee adjustments needed to comply with changed regulations or tariffs.</p>	<p>The County must negotiate with the contractor to make County-desired or regulatory or utility driven changes.</p> <p>The County will have to negotiate with the contractor on the costs for capital improvements and O&M service fee adjustments needed to comply with the changed regulations or tariffs.</p>

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Criteria	CMAR	DB	DBO	DBFO
Cash Flow	The County must make progress payments throughout the design and construction of the project.	The County must make progress payments throughout the design and construction of the project.	The County must make progress payments throughout the design and construction of the project.	The County makes no payments until the Project is complete and has passed the acceptance test. Private financing may be available for longer terms (e.g. 30 years) than typical for public financing which will reduce annual costs although interest costs will be higher.
Cost – Present Value	The costs are likely to be higher than with DB and DBO because of the efficiencies inherent in the alternative methods.	Time saved by overlapping design and construction and from producing less detailed design documents results in savings compared to conventional delivery methods.	Integration of operations into the design effort and the efficiency of private operation provide further savings beyond DB.	The cost of private financing is greater than public, tax exempt financing which results in an increase in the cost of the Project.
Predictability of Costs	<p>Contractor is usually entitled to a change order if project conditions change or design or construction problems occur.</p> <p>The County is not protected from disputes among the design engineer and the builder. Occasionally associated with bid protests, and also often the subject of litigation once the construction contract is executed.</p> <p>The County workforce operates and maintains the project with no guaranteed fixed annual O&M cost.</p>	<p>A change in project conditions may result in a change order but design or construction problems do not. Contractor is responsible for plans and specs and cannot use deficiencies in them to expect a change order.</p> <p>The County workforce operates and maintains the project with no guaranteed fixed annual O&M cost.</p> <p>Less prone than CMAR to bid protests and litigation because of the prequalification of contractor teams and the extended opportunity to negotiate a mutually advantageous contract under which the contractor is willing to assume design liability</p> <p>A found cost growth for DB projects was 5.2% less than for DBB project for 351 projects.</p>	<p>Operators provide input during design that may further reduce the potential for overruns. Agreements obligate contractors to provide long term operation and maintenance services for a guaranteed fixed annual service fee, adjusted only for indexed inflation. Provides a single point of project responsibility. The County thus is immune from finger-pointing among the contracting team members.</p> <p>Less prone than CMAR to bid protests and litigation because of the prequalification of contractor teams and the extended opportunity to negotiate a mutually advantageous contract under which the contractor is willing to assume design liability</p>	<p>Operators provide input during design that may further reduce the potential for overruns. Agreements obligate contractors to provide long term operation and maintenance services for a guaranteed fixed annual service fee, adjusted only for indexed inflation. Provides a single point of project responsibility. The County thus is immune from finger-pointing among the contracting team members.</p> <p>Less prone than CMAR to bid protests and litigation because of the prequalification of contractor teams and the extended opportunity to negotiate a mutually advantageous contract under which the contractor is willing to assume design liability.</p> <p>The inclusion of financiers and equity providers add a due diligence element to the Project, especially with respect to budget and schedule management.</p>

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Criteria	CMAR	DB	DBO	DBFO
Fiscal and Legal Complexity	Allows County to use its typical long term financing approach with the low interest rates available for public financing, established procedures, established legality and low issuance costs.	Firm project price is known much sooner than in CMAR. Legality is established.	Firm project price is known much sooner than in CMAR. Legality is established.	Will involve private financing with higher interest rates but has advantages of minimal administration, may reduce impacts on County debt limits and the County will not be required to pay a service fee until the facility is operational. May offer potential for longer debt maturity. The payment to the DBFO contractor may be included in the "expenditure cap" for the County. This possibility is currently being analyzed. More legal and fiscal unknowns with this model.

References

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2. Molensar, K.R., Songer, A.D., and Barash, M., "Public-Sector Design/Build Evolution and Performance," ASCE Journal of Management in Engineering, page 54 (March/April, 1999).