

Basis of Estimate Summary

Approach

WorleyParsons has prepared a budgetary cost estimate for the Big Sandy Unit 2 wet limestone FGD system project, approximately 5 miles north of Louisa, Kentucky.

WorleyParsons began with an estimate shell from the Muskingum River Unit 5 estimate for the wet FGD system. Equipment pricing is based upon the technical parameters defined in the mechanical equipment list, electrical equipment list, and single line drawings. Preliminary budgetary quotations were solicited for the ID fans, field-erected tanks, dampers, expansion joints, boiler cameras, soot blowers & furnace cleaning equipment, air compressors, agitators, transformers, switchgear and MCCs. Unit pricing for concrete, gravel, sand, piles, and other civil commodities is based on quotes solicited for the Muskingum River Unit 5 FGD project and adjusted as necessary for local conditions. Steel and additional equipment pricing is based on pricing data from recent FGD projects, and has been adjusted to reflect design parameter differences.

Bulk quantity development is based on a combination of detailed engineering drawing take-offs, estimated take-offs from recent projects with similar systems, and factoring based on equipment parameters and building sizes. The quantities are also based on the equipment locations per the general arrangement drawings. Input from engineering was solicited for major bulk commodities such as concrete for major foundations, duct steel, support steel, large and small bore piping (both above ground and underground) electrical duct bank, medium voltage cable, and cable tray. The balance of electrical bulk commodities were developed using an average length approach based on the number of expected loads and general arrangement of the equipment. The balance of bulk material quantities were developed by applying factors to a similar project's quantities based on the specific site characteristics and the physical location of the Big Sandy Station equipment. These quantities are compared at a summary level to quantities from similar projects as an added level of verification.

The bulk quantities in the direct cost estimate file are not "neat" quantities. They have been adjusted to include procurement, design and waste allowances.

WorleyParsons has incorporated AEP's recommended crew wage rates based on their current plant labor data.

Commercial/Construction Clarifications

- The expected accuracy of this estimate is +15/-5 %.
- No contingency has been applied to the project costs per AEP. AEP is carrying all project contingency. WP recommends a 10% contingency be applied due to the preliminary nature of the design.
- The estimate is prepared in March 2006 dollars.
- The estimate is based on normal market conditions in effect in late 2005 regarding material procurement and construction.
- No escalation has been applied to the project costs per AEP. AEP is carrying all project escalation. WP recommends the following escalation:
 - Bulk material at 3% per year and taken to the midpoint of bulk material procurement;
 - Equipment at 5% per year taken to the midpoint of equipment procurement.
 - Craft labor at 4.75% per year and taken to the midpoint of construction.
- No additional escalation has been applied to account for unpredictable fluctuations in market pricing of raw materials. In addition, no specific escalation has been added as a result of recent natural disasters (i.e., Hurricane Katrina) and their impact on material market pricing and transportation costs.
- The estimate includes a 5% Contractor's mark-up on bulk materials.
- The estimate is based on an EPCM contracting strategy with major subcontract packages. The subcontract packages are Sitework/Site Preparation, Foundations, Chimney (AEP), FGD Erection (AEP/OEM), Material Handling, Steel & Duct Erection, Switchyard, Field Erected Tanks, BOP Mechanical/Piping, Electrical, Insulation, & Buildings/Architectural.
- The estimate is based on AEP recommended union shop craft rates, having jurisdiction in the Louisa, Kentucky area. The wage rates are based on the 90% rate granted in the NMA (National Maintenance Agreement) with AEP.
- A local area union productivity factor of 15% has been applied to labor man-hours. Additional AEP recommended productivity factors have been applied as follows: 10% to electrical & piping, and 8% on the balance of man-hours.
- Per the NMA, subsistence or travel costs are excluded.
- All contractors will be responsible to conform to the site security and safety requirements in effect on the plant site.
- All federal, state and local taxes are excluded, with the exception of payroll taxes.
- Allowances for import or customs duties are excluded.
- The estimate considers that AEP is providing all Builder's risk coverage for the project to include the interests of AEP, Contractors and subcontractors of all tiers with waiver of subrogation between all insured parties.
- Bid bonds, performance or advance payment bonds are excluded in the estimate.
- Permitting is excluded.
- Operational spare parts are excluded.
- Start-up spare parts are included.

- Off-take of all electricity (construction power), and normal operational effluents (lube oil flush & first fills) generated during start-up, testing and initial operation are excluded.
- The cost of startup and commissioning power from the grid is excluded.
- The cost of startup and commissioning fuels is excluded.
- The site for the project, with the exception of specifically addressed demolitions, relocations and removals, will be provided to the Contractor free and clear. The Contractor will be responsible for any clearing and grubbing, site fill, site fencing, site security, site access roads, and site utilities that are supplemental to existing facilities.
- Archeological investigation is excluded.
- Removal of obstructions encountered during excavation work is excluded, with the exception of those specifically identified.
- Mitigation of any pre-existing hazardous materials is excluded, including any contaminated soils in the vicinity of the abandoned oil tank.
- An allowance for chromium and lead based paint removal and asbestos abatement is included per AEP direction. The scope of this work is undefined, therefore the allowance is subject to change pending a detailed evaluation.
- The design for all systems and the supporting balance-of-plant systems is based on proven technology currently in use for removal of sulfur in coal-fired facilities. No unique, new, or unproven technology is being considered.
- OEM material and installation scope is excluded from the WorleyParsons estimate.
- The estimate is based on all AEP furnished equipment being delivered at the project site.
- The estimate is based on the byproduct dewatering option A site.
- Coal blending is included as an allowance.
- The upgrade, repair and modification of any existing plant systems not specifically related to the FGD system design are excluded.

Mechanical

- The OEM FGD material and installation is being purchased by AEP. The costs for furnishing and installing the OEM process related equipment and bulk commodities are excluded from this estimate.
- FGD process piping between buildings in the JBR area and between the remote preparation and dewatering buildings is included. Process piping within the JBR is excluded since it is part of the OEM scope of work.
- ESP modifications to the outlet nozzles are excluded.
- Piping between process tanks and pumps located near buildings is excluded; it is part of the OEM scope.
- A new concrete chimney is being purchased by AEP. The stack flue isolation damper is excluded. The costs for material and installation are excluded from this estimate.
- Air heater, boiler, ductwork, and ESP stiffening is AEP's scope of work and is excluded from the estimate.

- Water treatment system scope is excluded. The scope of the water treatment system is by AEP.
- The scope includes furnishing and installing four 18,000 HP axial ID fans, based on a balanced draft design, in an arrangement with parallel sets of two fans in each train.
- The existing ID booster fans will be abandoned. The scope does not include the removal of the existing ID booster fans, the associated steel or foundation modifications.
- The scope includes modifications to the existing FD fans.
- Modifications to the existing makeup water pumps are excluded.
- A new limestone unloading and handling system is included, with unloading & conveyor systems, transfer conveyors, stack out conveyors, reclaim hopper and feeders. The unloading rate is a maximum of 400 tph and the reclaiming rate is a maximum of 240 tph.
- The limestone handling systems exclude freeze protection and dust suppression for the storage piles.
- Furnace cleaning system (soot blowers & water cannons) and high temperature infrared cameras are included as part of the boiler modification scope
- Labor to install an SO₃ mitigation system consisting of dry sorbent duct injection is included. The material cost of the SO₃ mitigation system is with the AEP estimate. supply.
- Magnesium hydroxide furnace injection scope is excluded.
- The scope includes furnishing and installing the insulation on new ductwork.
- The scope includes extending service air and instrument air from two new 100% air compressors located in the FGD area. The instrument air and service air will be provided to the limestone byproduct areas.
- The existing underground fire loop will be extended to the new FGD building, the reagent preparation area, the byproduct dewatering area and the coal unloading area. Fire deluge systems are also included at the new transformers.
- Hose stations and portable fire extinguishers are provided as required per NFPA requirements.
- Emergency shower eyewash units are included in the FGD area, reagent preparation area, and remote dewatering area.
- The existing plant service water system will be utilized to supply water for the new boiler water cannons. All other FGD service water requirements are supplied from the FGD service water system.
- The service water piping will be extended from a point inside boiler house to the absorber area and the dewatering area.
- The existing potable water system will be extended to supply the new warehouse, the FGD buildings, the construction trailer area and other miscellaneous areas.
- The scope includes the demolition and removal of a 3,400,000 gallon abandoned oil tank. The emptying and cleaning of the tank prior to demolition is excluded.
- Modifications to the existing ash handling are excluded.
- Cranes and hoists are included for the FGD units.
- Dampers are included, where required.

Electrical

- The electrical scope begins at the transition point of the 2-138kV overhead lines.
- The switchyard scope includes (2) 138kV disconnect switches and associated material. The substation cost is based on vendor information for equipment being installed at the AEP Mitchell plant for the air quality control modifications.
- Overhead electrical line work is excluded from the estimate. All overhead electrical line work is in AEP's scope of work.
- The electrical switchgear pricing is based on the use 13.8kV rated gear with a one high cubicle arrangement.
- One spare feeder breaker is included in all switchgear line-ups.
- All electrical equipment will be indoor rated and located in a PDC or pre-engineered building.
- Medium voltage cable is based on using 5 & 15kV rated, single conductor, shielded cable.
- Medium voltage cable quantities are based on scaled drawing takeoffs.
- Low voltage cable quantities are based on an average circuit length depending on the location of the MCCs or panelboards and the average distance from the loads.
- The complete electrical distribution scope for the limestone and byproduct material handling systems is included with the vendor's cost for those systems.
- The aircraft warning lighting system for the new chimney is included with the new chimney. The scope for lighting includes a feed to the chimney aircraft warning lighting panel only.
- Fire detection/protection is provided for the transformers, various buildings, electrical equipment rooms, transfer towers, and conveyors (over 40' above grade).
- A DC/UPS system consisting of the station battery system, chargers, UPS, and panelboards is included.
- All carbon steel tanks and U/G carbon steel pipe are cathodically protected, as required.
- Lighting is included for all new buildings, conveyors, roadways, new parking lots and other exterior areas as required. Area lighting is excluded for the outdoor storage piles.
- Costs for the DCS system excluded. AEP is including costs for DCS and any associated upgrades to the existing system.
- Costs for the CEMS and shelter are excluded. AEP is including costs for CEMS.
- Electrical demolition and relocation of existing equipment are excluded.

Civil/Structural

- The scope includes furnishing and installing ductwork from the tie-in point near Precipitator #2 to the ID booster fans, from the ID booster fans to the absorber, and from the absorber to the chimney.
- FGD ductwork, expansion joints, insulation, support steel and foundations are included. FGD ductwork is 100% panelized.

- Two foundations are included for the 2 pair of ID booster fans in series.
- Demolition of two existing warehouse buildings, a guard house, and their foundations in the FGD area is included. One warehouse will be dismantled, relocated and reassembled, and another will be replaced with a new warehouse.
- An allowance is included for the construction of the new, metal, warehouse building in a new location (130' x 100' x 20'h). The final size of the warehouse is to be determined by AEP.
- An allowance is included for the construction of a new 10,500 SF office building. Initially, this building will be used by contractors during construction, and then it will be finished as a new office/service building for plant operations. The final size of the office building is to be determined by AEP.
- Foundations for the absorber maintenance tank, re-hydration tanks (2), reclaim water tanks (2), filter feed tanks (2), reagent storage tanks (2), and the FGD makeup water tank are included.
- The transformer foundations include oil containment.
- A new common chimney foundation and absorber foundation are included.
- Limestone conveyor and transfer tower foundations are included.
- The sumps are included with the building foundations
- A limestone reclaim hopper and tunnel are included.
- Auger cast piles are included for the chimney, absorber, ID fans, JBR pump building, limestone prep/reagent building, and maintenance storage tank. Micropiles are included for the duct supports.
- The construction parking and lay down area is approximately 9 acres.
- Storm drainage ponds and piping are included.
- New onsite parking and roads are included.
- The structural steel will be coated with a 3-coat paint system.
- An allowance is included for engineered pipe supports.
- An allowance for hydro-excavation during construction in the main plant area is included based on experience from the Mitchell plant.
- The estimate is based on using local concrete plants.
- Additional construction stone has been included for use during construction for replacement of fill for adverse weather, temporary roads, laydown, etc., based on experience at the Mitchell plant.
- The estimate includes jacking and boring under County Road 23 and under the railroad tracks.
- The estimate includes stone & cribbing for construction cranes.
- An allowance is included for dewatering the excavations of the limestone reclaim and unloading pits and tunnels.