# LG&E/KU – Mill Creek Station

# Phase II Air Quality Control Study

# Operations and Maintenance Cost Estimate (Without SCR)

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**Revision B – Issued For Client Review**

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# 1.0 Operations and Maintenance Cost Estimate

The levelized annual incremental Operations and Maintenance (O&M) cost estimates for the LG&E/KU Mill Creek Station Phase II Air Quality Control Study were derived from proprietary Black & Veatch O&M estimating tools and representative estimates for similar projects. Costs were based on vendor estimates and recommendations; estimated performance information; typical costs for materials, supplies, consumables and chemicals; and input from LG&E/KU for existing plant staffing and labor rates. Black & Veatch has summarized these costs into two primary categories: fixed costs and variable costs. Fixed costs, expressed as dollars per unit of net capacity per year ($/kW-yr), do not vary directly with plant power generation and consist primarily of wages and wage-related overheads for the permanent plant staff and routine equipment maintenance. This is in contrast to the variable costs, expressed as dollars per unit of net generation ($/MWh), which tend to vary in nearly direct proportion to the output of the unit. Variable O&M includes costs associated with ash and Wet Flue Gas Desulfurization (WFGD) byproduct disposal, chemicals, reagents, utilities, and other consumables.

An electricity cost due to increased plant auxiliary power was estimated by Black & Veatch with input from LG&E/KU for the cost per unit of generation in 2011. The cost of lost revenue due to increased auxiliary power requirements is not included in the fixed or variable O&M cost in Table 1-2, but is listed separately and added to the total variable costs for budgetary uses in Table 1-3.

Fuel costs are determined separately and not included in either fixed or variable O&M costs.

## 1.1 Fixed Costs

The major element in the estimate of incremental fixed O&M is the cost of wages for the additional labor to staff the facility. Increased staffing was estimated for the plant as a whole, not on an individual unit basis, with the understanding that there is one common control room for all four units. It was estimated that the plant would require one additional operator per shift to support the additional Air Quality Control (AQC) equipment at the site. Mill Creek currently has four distinct operating crews which would result in a total of 4 additional operators. It was also estimated that the plant would need additional maintenance support at the site. The maintenance craft personnel would consist of a total of two mechanical maintenance personnel and two instrument and control (I&C) technicians in order to ensure the reliability of the additional plant systems.

Table 1-1 shows the estimated incremental staffing plan and associated salaries. The salaries for each added position were based on an average rate of $63.89/hour and

2,080 hours per year. It was understood that the rate of $63.89/hour, provided by LG&E/KU, is a fully-loaded labor rate.

Other incremental fixed O&M costs include routine maintenance for the additional AQC equipment on each unit. The routine maintenance costs for the ash handling systems for all four units were increased based on the added equipment and additional byproduct being captured. Unit 1 and 2 Cold-side Electrostatic Precipitators (CS-ESPs) will utilize the existing combined fly ash handling system for sellable ash while Unit 1 and 2 Pulse Jet Fabric Filters (PJFFs) will have their own new combined fly ash handling system for waste ash. Units 3 and 4 will each have a new fly ash handling system for waste ash that is collected in the PJFF and utilize the existing fly ash handling system for sellable ash that is collected in the CS-ESPs and existing system.

On Units 1 and 2 new ID fans with Variable Frequency Drives (VFD) are replacing existing ID fans and booster fans with hydraulic couplings while for Units 3 and 4 new booster fans with VFDs are supplementing the existing ID fans with hydraulic couplings, resulting in the same number of overall fans at the plant. Based on previous Black & Veatch studies, it is estimated that the maintenance cost for centrifugal fans with a hydraulic coupling versus centrifugal fans with a VFD are similar. As a result it was estimated that the difference in annual maintenance cost for the ID and booster fans at the Mill Creek plant would be negligible.

The estimate of annual fixed O&M costs in 2011 US $/kW-yr is shown in Table 1-2.

## 1.2 Variable Costs

The major elements of the expected incremental variable costs include ash and WFGD byproduct disposal, reagents, and other consumables. Ash and WFGD byproduct disposal costs include the additional byproduct being generated due to added AQC equipment and increased limestone consumption. Fly ash quantities currently sold or given away were provided by LG&E/KU on a plant basis and were not available on a unit by unit basis. Black & Veatch verified that this amount, to be collected in all four CS-ESPs, will be available to be sold or given away in the new AQC configuration; therefore, it was assumed that the same amount of fly ash that is currently being sold or given away will continue to be sold or given away. The current amount of fly ash sold or given away was not provided specifically for each unit; therefore, the actual increase in ash disposal cost was not able to be determined on a unit basis, but the overall increase in ash disposal cost for the plant was calculated. The increase in fly ash generation, limestone use and WFGD byproduct generation was estimated on a per unit basis.

Reagents and other consumables costs are based upon unit price input from LG&E/KU to the extent available, selected vendors, and Black & Veatch's past project

experience for the selected technology, given the expected fuel constituents and the respective emissions limits.

The estimate of annual variable O&M costs in 2011 US $/MWh is included in Table 1-2. The total net generation (in MWh) is based on the estimated capacity factor and rated net winter capacity for each respective unit.

Variable O&M costs are based on the following assumptions:

- Annual reagent and consumables usage and ash and WFGD byproduct generation are based on full load unit operation and each unit's respective capacity factor
    - Unit 1: 68.00%
    - Unit 2: 70.00%
    - Unit 3: 75.00%
    - Unit 4: 75.00%
- Ash and WFGD byproduct waste disposal cost is $15/ton
- Limestone cost is $7.54/ton
- Pulse jet fabric filter bag replacement cost is $100/bag
- Pulse jet fabric filter cage replacement cost is $50/cage
- Pulse jet fabric filter bags and cages are replaced every three years
- Halogenated PAC cost is $1.10/lb
- Trona cost is $195/ton
- Changes in revenue from ash and gypsum sales were not considered
- Incremental water usage, water disposal, and water treatment costs are considered to be negligible

The incremental auxiliary power increase for each unit was estimated by Black & Veatch while the auxiliary power cost for each unit was provided by LG&E/KU. Incremental auxiliary power use and costs are listed in Appendix A.

**Table 1-1. Incremental O&M Staffing Plan and Labor Expenses**

| | Per Shift | Shifts | Total | Annual Base Wages[1] | Over Time % | Payroll | Burden % | Total Annual Expense |
|---|---|---|---|---|---|---|---|---|
| **OPERATIONS** | | | | | | | | |
| Operator | 1 | 4 | 4 | $132,891 | 0 | $531,565 | 0 | $531,565 |
| | | | | | | | **Operations Subtotal** | **$531,565** |
| **MAINTENANCE** | | | | | | | | |
| Mechanic | 2 | 1 | 2 | $132,891 | 0 | $265,782 | 0 | $265,782 |
| I&E Technician | 2 | 1 | 2 | $132,891 | 0 | $265,782 | 0 | $265,782 |
| | | | | | | | **Maintenance Subtotal** | **$531,565** |
| | **Total Staff** | | **8** | | | | **Grand Total Annual Labor Expenses** | **$1,063,130** |

Notes:
1. Fully loaded labor rate.

**Table 1-2. Annual Incremental Fixed and Variable O&M Costs**

**(all costs in $1000)**

| | Unit 1 | Unit 2 | Unit 3 | Unit 4 | Total Plant |
|---|---|---|---|---|---|
| **Labor**[1] | | | | | |
| Operations | $133 | $133 | $133 | $133 | $532 |
| Maintenance | $133 | $133 | $133 | $133 | $532 |
| **Labor Subtotal** | **$266** | **$266** | **$266** | **$266** | **$1,063** |
| **Maintenance** | | | | | |
| Ash Handling System | $54 | $54 | $67 | $80 | $255 |
| Particulate Control System (PJFF) | $36 | $36 | $44 | $52 | $166 |
| PAC Injection System | $13 | $13 | $13 | $13 | $52 |
| Sorbent Injection System (Trona) | $35 | $35 | $35 | $35 | $140 |
| **Maintenance Subtotal** | **$138** | **$138** | **$159** | **$180** | **$613** |
| **FIXED COSTS** | **$404** | **$404** | **$425** | **$446** | **$1,676** |
| Ash Disposal[2] | $174 | $185 | $253 | $304 | $916 |
| WFGD byproduct Disposal | $24 | $26 | $281 | $257 | $588 |
| Limestone Usage | $8 | $8 | $87 | $80 | $183 |
| PJFF Bag & Cage Replacement | $464 | $464 | $552 | $656 | $2,135 |
| Mercury Control (PAC Injection) | $5,133 | $5,518 | $7,097 | $8,643 | $26,391 |
| $SO_3$ Control (Sorbent Injection) | $2,237 | $2,364 | $3,220 | $3,918 | $11,739 |
| Neural Network Support | $50 | $50 | $50 | $50 | $200 |
| **VARIABLE COSTS** | **$8,090** | **$8,614** | **$11,540** | **$13,908** | **$42,151** |
| **Winter Net Capacity (MW)** | **303** | **299** | **397** | **492** | **1,491** |
| **Net Generation (MWh)** | **1,805,609** | **1,833,468** | **2,608,290** | **3,232,440** | **9,479,807** |
| **Fixed Costs, $/kW-yr** | **$1.33** | **$1.35** | **$1.07** | **$0.91** | **$1.12** |
| **Variable Costs, $/MWh** | **$4.48** | **$4.70** | **$4.42** | **$4.30** | **$4.45** |

Notes:

1. Staffing and associated costs shown for total plant, but divided up equally among the four units.
2. Current annual fly ash quantities sold or given away were not provided on a unit basis. Therefore, changes in ash/byproduct disposal costs do not reflect actual increases for each unit. Ash disposal costs shown for total plant should be used.
3. Variable Costs in this table do not include Auxiliary Power Costs.

**Table 1-3. Summary O&M Costs**

| | **Total Fixed Costs** | Variable Costs | Auxiliary Power Costs | **Total Variable Costs** | **Total O&M Costs** |
|---|---|---|---|---|---|
| **Unit 1** | | | | | |
| WFGD | **$0** | $32,000 | $0 | **$32,000** | **$32,000** |
| PJFF[1] | **$356,000** | $638,000 | $329,086 | **$967,086** | **$1,323,086** |
| PAC Injection | **$13,000** | $5,133,000 | $5,677 | **$5,138,677** | **$5,151,677** |
| Sorbent injection | **$35,000** | $2,237,000 | $7,634 | **$2,244,634** | **$2,279,634** |
| Neural Network | **$0** | $50,000 | $0 | **$50,000** | **$50,000** |
| **Unit 1 Subtotal** | **$404,000** | $8,090,000 | $342,397 | **$8,432,397** | **$8,836,397** |
| **Unit 2** | | | | | |
| WFGD | **$0** | $113,000 | $0 | **$113,000** | **$113,000** |
| PJFF[1] | **$356,000** | $569,000 | $372,814 | **$941,814** | **$1,297,814** |
| PAC Injection | **$13,000** | $5,518,000 | $5,879 | **$5,523,879** | **$5,536,879** |
| Sorbent injection | **$35,000** | $2,364,000 | $7,906 | **$2,371,906** | **$2,406,906** |
| Neural Network | **$0** | $50,000 | $0 | **$50,000** | **$50,000** |
| **Unit 2 Subtotal** | **$404,000** | $8,614,000 | $386,599 | **$9,000,599** | **$9,404,599** |
| **Unit 3** | | | | | |
| WFGD | **$0** | $368,000 | $229,720 | **$597,720** | **$597,720** |
| PJFF[1] | **$377,000** | $805,000 | $722,247 | **$1,527,247** | **$1,904,247** |
| PAC Injection | **$13,000** | $7,097,000 | $6,769 | **$7,103,769** | **$7,116,769** |
| Sorbent injection | **$35,000** | $3,220,000 | $9,103 | **$3,229,103** | **$3,264,103** |
| Neural Network | **$0** | $50,000 | $0 | **$50,000** | **$50,000** |
| **Unit 3 Subtotal** | **$425,000** | $11,540,000 | $967,839 | **$12,507,839** | **$12,932,839** |
| **Unit 4** | | | | | |
| WFGD[2] | **$0** | $337,000 | $1,205,889 | **$1,542,889** | **$1,542,889** |
| PJFF[1,2] | **$428,000** | $960,000 | $410,218 | **$1,370,218** | **$1,798,218** |
| PAC Injection | **$13,000** | $8,643,000 | $6,490 | **$8,649,490** | **$8,662,490** |
| Sorbent injection | **$35,000** | $3,918,000 | $8,728 | **$3,926,728** | **$3,961,728** |
| Neural Network | **$0** | $50,000 | $0 | **$50,000** | **$50,000** |
| **Unit 4 Subtotal** | **$476,000** | $13,908,000 | $1,631,326 | **$15,539,326** | **$16,015,326** |
| | | | | | |
| **TOTAL** | **$1,709,000** | | | **$45,480,161** | **$47,189,161** |

Notes:

1. PJFF Total O&M includes labor costs, ash handling, fabric filter and miscellaneous auxiliary power costs (note 2) for Units 1, 2, 3, and 4.
2. For Unit 4, miscellaneous auxiliary power costs are split 60% to the WFGD and 40% to the PJFF.

# Appendix A
# Auxiliary Power Costs

The table below is a summary of the Mill Creek differential auxiliary power costs.

| Mill Creek Differential Auxiliary Power Costs | | | | | |
|---|---|---|---|---|---|
| **Units** | **Differential Aux** | Capacity | **Annual Diff.** | Aux Power | **Annual Aux** |
| | **Operating (kW)** | Factor | **Aux (MWh)** | Cost ($/MWh) | **Power Cost** |
| **Unit 1** | **2,666** | 68% | **15,881** | $21.56 | **$342,397** |
| **Unit 2** | **2,907** | 70% | **17,824** | $21.69 | **$386,599** |
| **Unit 3** | **6,320** | 75% | **41,520** | $23.31 | **$967,839** |
| **Unit 4** | **11,110** | 75% | **72,990** | $22.35 | **$1,631,326** |
| **Total** | **23,002** | | **148,215** | | **$3,328,161** |

| | Units | Differential Aux | Capacity | Annual Diff. | Aux Power | Annual Aux |
|---|---|---|---|---|---|---|
| | | Operating (kW) | Factor | Aux (MWh) | Cost ($/MWh) | Power Cost |
| Unit 1 | **WFGD** | 0 | 68% | **0** | $21.56 | **$0** |
| | **PJFF** | 2,562 | 68% | **15,264** | $21.56 | **$329,086** |
| | **PAC Injection** | 44 | 68% | **263** | $21.56 | **$5,677** |
| | **Sorbent Injection** | 59 | 68% | **354** | $21.56 | **$7,634** |
| | **Total Mill Creek 1** | **2,666** | | | | **342,397** |
| Unit 2 | **WFGD** | 0 | 70% | **0** | $21.69 | **$0** |
| | **PJFF** | 2,803 | 70% | **17,188** | $21.69 | **$372,814** |
| | **PAC Injection** | 44 | 70% | **271** | $21.69 | **$5,879** |
| | **Sorbent Injection** | 59 | 70% | **364** | $21.69 | **$7,906** |
| | **Total Mill Creek 2** | **2,907** | | | | **386,599** |
| Unit 3 | **WFGD** | 1,500 | 75% | **9,855** | $23.31 | **$229,720** |
| | **PJFF** | 4,716 | 75% | **30,984** | $23.31 | **$722,247** |
| | **PAC Injection** | 44 | 75% | **290** | $23.31 | **$6,769** |
| | **Sorbent Injection** | 59 | 75% | **391** | $23.31 | **$9,103** |
| | **Total Mill Creek 3** | **6,320** | | | | **967,839** |
| Unit 4 | **WFGD** | 8,212 | 75% | **53,955** | $22.35 | **$1,205,889** |
| | **PJFF** | 2,794 | 75% | **18,354** | $22.35 | **$410,218** |
| | **PAC Injection** | 44 | 75% | **290** | $22.35 | **$6,490** |
| | **Sorbent Injection** | 59 | 75% | **391** | $22.35 | **$8,728** |
| | **Total Mill Creek 4** | **11,110** | | | | **1,631,326** |

Notes:
1 For Units 1, 2, & 3, PJFF includes loads from PJFF, draft fans, ash handling, enclosures, and miscellaneous.

2 For Unit 4, loads from booster fans, enclosures, and miscellaneous are split 60% to the WFGD and 40% to the PJFF. Ash handling loads are assigned to the PJFF.

The tables below are a detailed breakdown of the differential auxiliary power use for each Mill Creek unit.

| Mill Creek Unit 1 | | | | | |
|---|---|---|---|---|---|
| **List of Items** | **Normal Quantity Operating** | **Normal Operating HP** | **Normal Operating Time** | **Normal Operating kW** | **Total Operating kW** |
| **ID FANS** | | | | | |
| ID FANS (Note 2) | 2.0 | 4700.0 | 24.0 | 4124.9 | 8,250 |
| MISC ID FAN LOADS (lube oil pumps, heater, cooling fans) | 2.0 | 15.0 | 24.0 | 12.0 | 24 |
| CURRENT EXISTING ID AND BOOSTER FANS | 2.0 | -3800.0 | 24.0 | -3335.1 | -6,670 |
| EXISTING MISC ID AND BOOSTER FAN LOADS CANCEL OUT W/ NEW FAN | 2.0 | -15.0 | 24.0 | -12.0 | -24 |
| ***ID FAN SUBTOTAL*** | | | | | ***1,580*** |
| **PULSE JET FABRIC FILTER (PJFF)** | | | | | |
| ***PJFF SUBTOTAL*** | | | | | ***397*** |
| **POWDER ACTIVATED CARBON (PAC) INJECTION** | | | | | |
| ***PAC INJECTION SUBTOTAL*** | | | | | ***44*** |
| **SORBENT INJECTION** | | | | | |
| ***SORBENT INJECTION SUBTOTAL*** | | | | | ***59*** |
| **ENCLOSURE LOADS** | | | | | |
| ***ENCLOSURE LOADS SUBTOTAL*** | | | | | ***183*** |
| **MISCELLANEOUS LOADS** | | | | | |
| ***MISC LOADS SUBTOTAL*** | | | | | ***402*** |
| | | | | | |
| **TOTAL** | | | | | **2,666** |

Notes:

| | |
|---|---|
| 1 | Motor Efficiencies were assumed at 93% except for compressors and ID fan drivers including VFDs which were assumed at 85% |
| 2 | ID Fan horsepowers were recalculated without SCRs and with the existing ESPs remaining. |

| Mill Creek Unit 2 | | | | | |
|---|---|---|---|---|---|
| **List of Items** | **Normal Quantity Operating** | **Normal Operating HP** | **Normal Operating Time** | **Normal Operating kW** | **Total Operating kW** |
| **ID FANS** | | | | | |
| ID FANS (Note 2) | 2.0 | 4700.0 | 24.0 | 4124.9 | 8,250 |
| MISC ID FAN LOADS (lube oil pumps, heater, cooling fans) | 2.0 | 16.0 | 24.0 | 12.8 | 26 |
| CURRENT EXISTING ID AND BOOSTER FANS | 2.0 | -3800.0 | 24.0 | -3335.1 | -6,670 |
| EXISTING MISC ID AND BOOSTER FAN LOADS CANCEL OUT W/ NEW FAN | 2.0 | -16.0 | 24.0 | -12.8 | -26 |
| ***ID FAN SUBTOTAL*** | | | | | ***1,580*** |
| **PULSE JET FABRIC FILTER (PJFF)** | | | | | |
| ***PJFF SUBTOTAL*** | | | | | ***638*** |
| **POWDER ACTIVATED CARBON (PAC) INJECTION** | | | | | |
| ***PAC INJECTION SUBTOTAL*** | | | | | ***44*** |
| **SORBENT INJECTION** | | | | | |
| ***SORBENT INJECTION SUBTOTAL*** | | | | | ***59*** |
| **ENCLOSURE LOADS** | | | | | |
| ***ENCLOSURE LOADS SUBTOTAL*** | | | | | ***183*** |
| **MISCELLANEOUS LOADS** | | | | | |
| ***MISC LOADS SUBTOTAL*** | | | | | ***402*** |
| | | | | | |
| **TOTAL** | | | | | **2,907** |

Notes:

| | |
|---|---|
| 1 | Motor Efficiencies were assumed at 93% except for compressors and ID fan drivers including VFDs which were assumed at 85% |
| 2 | ID Fan horsepowers were recalculated without SCRs and with the existing ESPs remaining. |

| Mill Creek Unit 3 | | | | | |
|---|---|---|---|---|---|
| **List of Items** | **Normal Quantity Operating** | **Normal Operating HP** | **Normal Operating Time** | **Normal Operating kW** | **Total Operating kW** |
| **BOOSTER FANS** | | | | | |
| BOOSTER FANS | 2.0 | 3500.0 | 24.0 | 3071.8 | 6,144 |
| MISC BOOSTER FAN LOADS (lube oil pumps, heater, cooling fans) | 2.0 | 14.0 | 24.0 | 11.2 | 22 |
| CURRENT EXISTING ID FANS | 2.0 | -6100.0 | 24.0 | -5353.6 | -10,707 |
| FUTURE EXISTING ID FANS | 2.0 | 4500.0 | 24.0 | 3949.4 | 7,899 |
| MISC ID FAN LOADS CANCEL OUT | 2.0 | 0.0 | 24.0 | 0.0 | 0 |
| ***BOOSTER FAN SUBTOTAL*** | | | | | ***3,358*** |
| **PULSE JET FABRIC FILTER (PJFF)** | | | | | |
| ***PJFF SUBTOTAL*** | | | | | ***773*** |
| **POWDER ACTIVATED CARBON (PAC) INJECTION** | | | | | |
| ***PAC INJECTION SUBTOTAL*** | | | | | ***44*** |
| **SORBENT INJECTION** | | | | | |
| ***SORBENT INJECTION SUBTOTAL*** | | | | | ***59*** |
| **WET FLUE GAS DESULFURIZATION (WFGD)** | | | | | |
| CURRENT UNIT 3 SCRUBBER | 1.0 | | 24.0 | -4000.0 | -4,000 |
| CURRENT UNIT 4 SCRUBBER | 1.0 | | 24.0 | 5500.0 | 5,500 |
| ***ESP SUBTOTAL*** | | | | | ***1,500*** |
| **ENCLOSURE LOADS** | | | | | |
| ***ENCLOSURE LOADS SUBTOTAL*** | | | | | ***183*** |
| **MISCELLANEOUS LOADS** | | | | | |
| ***MISC LOADS SUBTOTAL*** | | | | | ***402*** |
| | | | | | |
| **TOTAL** | | | | | **6,320** |

Notes:

| | |
|---|---|
| 1 | Motor Efficiencies were assumed at 93% except for compressors and ID fan drivers including VFDs which were assumed at 85% |

| Mill Creek Unit 4 | | | | | |
|---|---|---|---|---|---|
| **List of Items** | **Normal Quantity Operating** | **Normal Operating HP** | **Normal Operating Time** | **Normal Operating kW** | **Total Operating kW** |
| **BOOSTER FANS** | | | | | |
| BOOSTER FANS | 2.0 | 3700.0 | 24.0 | 3247.3 | 6,495 |
| MISC BOOSTER FAN LOADS (lube oil pumps, heater, cooling fans) | 2.0 | 15.0 | 24.0 | 12.0 | 24 |
| CURRENT EXISTING ID FANS | 2.0 | -7500.0 | 24.0 | -6582.4 | -13,165 |
| FUTURE EXISTING ID FANS | 2.0 | 5500.0 | 24.0 | 4827.1 | 9,654 |
| MISC ID FAN LOADS CANCEL OUT | 2.0 | 0.0 | 24.0 | 0.0 | 0 |
| ***BOOSTER FAN SUBTOTAL*** | | | | | ***3,008*** |
| **PULSE JET FABRIC FILTER (PJFF)** | | | | | |
| ***PJFF SUBTOTAL*** | | | | | ***1,101*** |
| **POWDER ACTIVATED CARBON (PAC) INJECTION** | | | | | |
| ***PAC INJECTION SUBTOTAL*** | | | | | ***44*** |
| **SORBENT INJECTION** | | | | | |
| ***SORBENT INJECTION SUBTOTAL*** | | | | | ***59*** |
| **WET FLUE GAS DESULFURIZATION (WFGD)** | | | | | |
| REACTION TANK AGITATORS | 4.0 | 75.0 | 24.0 | 60.2 | 241 |
| RECYCLE PUMPS | 5.0 | 2000.0 | 24.0 | 1604.3 | 8,022 |
| SLURRY BLEED PUMPS | 1.0 | 175.0 | 24.0 | 140.4 | 140 |
| OXIDATION AIR BLOWERS | 1.0 | 3000.0 | 24.0 | 2406.5 | 2,406 |
| OXIDATION AIR BLOWER INLET GUIDE VANES | 1.0 | 3.0 | 24.0 | 2.4 | 2 |
| OXIDATION AIR LUBE OIL PUMPS | 2.0 | 25.0 | 24.0 | 20.1 | 40 |
| OXIDATION AIR BLOWER BLOWOFF VALVE MOTORS | 1.0 | 3.0 | 24.0 | 2.4 | 2 |
| OXIDATION AIR BLOWER DISCHARGE DIFFUSER VANE MOTORS | 1.0 | 3.0 | 24.0 | 2.4 | 2 |
| MIST ELIMINATOR WASH WATER PUMPS | 1.0 | 115.0 | 24.0 | 92.2 | 92 |
| ABSORBER AREA SUMP PUMPS | 1.0 | 30.0 | 1.0 | 24.1 | 1 |
| ABSORBER AREA SUMP AGITATORS | 1.0 | 8.5 | 24.0 | 6.8 | 7 |
| CHLORINE BLEED PUMPS | 1.0 | 20.0 | 24.0 | 16.0 | 16 |
| HYDROCYCLONE UNDERFLOW TRANSFER TANK AGITATOR | 1.0 | 75.0 | 24.0 | 60.2 | 60 |
| HYDROCYCLONE UNDERFLOW TRANSFER PUMPS | 1.0 | 175.0 | 24.0 | 140.4 | 140 |
| CURRENT EXISTING UNIT 4 SCRUBBER | 1.0 | | 24.0 | -5500.0 | -5,500 |
| ***WFGD SUBTOTAL*** | | | | | ***5,673*** |
| **ENCLOSURE LOADS** | | | | | |
| ***ENCLOSURE LOADS SUBTOTAL*** | | | | | ***620*** |
| **MISCELLANEOUS LOADS** | | | | | |
| ***MISC LOADS SUBTOTAL*** | | | | | ***604*** |
| | | | | | |
| **TOTAL** | | | | | **11,110** |

Notes:

| | |
|---|---|
| 1 | Motor Efficiencies were assumed at 93% except for compressors and ID fan drivers including VFDs which were assumed at 85% |