CLIENT
Arc Furnace and Blending PLC

Control System Upgrade

Scope Document

Document status: FINAL

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1. Executive Summary

This document represents a high level overview of the current install base and future state requirements along with the envisaged scope of works and supply.

1.1 Preamble

The project deals with the **upgrade of the control systems** for the following plant areas:

1. Arc Furnace PLC
2. Blending PLC

Presently control is performed by two separate Siemens S5 PLC control systems. A third PLC (Siemens S7_317-2DP) is used to control the Bag Plant. The S5 PLC's communicate to two separate CITECT SCADA systems via Profibus FDL while the S7 PLC communicates to the one SCADA via Ethernet. The SCADA's are configured as redundant server pair (network not redundant).

It is the intention of this project to **incorporate** the existing S5 Siemens PLC's into the existing S7 PLC. The Siemens Web Site indicates the following specifications for the latest 317-2DP (2AJ10):

1. 512KB Integrated Memory
2. 0.05 µS processing speed for binary instructions
3. 65,536 Digital Inputs, 65,536 Digital Outputs, 4,096 Analogue Inputs, 4,096 Analogue Outputs
4. 124 DP slaves (ET stations) @ 12Mb.
5. Step 7 V5.2 Sp1 or later

While a previous standard has been established using the Siemens S7_400 range on the Services Plant area CLIENT has opted to treat this site (almost adjacent to the 1st project) as a **separate business** with separate standards.

Please be advised that the SCADA system is to remain mainly **unchanged** except were pointed out differently within. The document also makes reference to other works to be incorporated into the project. This includes but is not limited to decommissioning of existing mimic control desks, re-routing of cables, splitting of safety signals and installation of additional instrumentation. More details are documented per area.

In terms of access to the system CLIENT at this point cannot provide an extended shut period to execute the migration and as a result of this a **"live change over philosophy"** will have to be adopted for the project. A furnace rebuild is currently being planned for closer to June 2008 which may provide a limited window of opportunity to complete the change over.

A major concern to be considered is the state of the existing panels and cabling specifically in terms of the Arc Furnace Area and also associated restricted space available. For this reason the project is considered an extremely high risk project and detailed risk mitigation planning will be required to be performed. Two scenarios are envisaged to migrate namely: Install new marshalling panel in close proximity to existing control panel and move termination points **or** relocate IO module to Furnace floor levels. The 2nd option is envisaged to be too costly and also environment is extremely harsh. The 1st option while risky is considered the optimal solution. Integrators are expected to provide costing for both options. The feasibility to opt for a combined solution based on scenarios was not considered.

The feasibility to change the control philosophy of the Furnace from current to resistance controlled is also currently being reviewed and for this reason the tenderer is to make provision for interfacing to an Advanced Process Control (APC) System typically by means op OPC as defined within.

1.2 High Level Scope Summary

The scope is summarized as follows:

1.2.1 Services

1. Clarification Phase:
    a. Trace and Generate / Red Line "AS-BUILT" LOOP drawings and IO listing only:
        i. Arc Furnace MCC Typical drawing exists and AS-BUILT is to be generated.
        ii. Blending drawings do exist (scanned) and needs to be redlined to IO listing
        iii. "AS-BUILT" drawings is to be digitized to contain any previous redlining
    b. Draft MCC room sizes on site plan general arrangement (GA) reflecting enclosures.
    c. Document enclosure contents in the form of GA drawings
    d. Retrieve current Arc Furnace control system program and redline existing AS-IS FDS
    e. Retrieve current Blending control system program and generate AS-IS FDS

It is VITAL that all relevant aspects of the "AS-BUILT" be captured to detail as defined in section **4.17**.

2. Design Phase:
    a. Design naming and numbering conventions for applicable scope elements with CLIENT
    b. Draft following design drawings / documents:
        i. Proposed system layout
        ii. Proposed IO listing / interface schedule / Instrument Specification
        iii. Proposed panel back plate GA drawings
        iv. Detailed Bill of Materials (BOM)
        v. Proposed Cable route diagrams in relation to site GA and enclosures
        vi. Revised AS-BUILT drawings reflecting new control gear
        vii. Any other associated design drawings for items in tenderers scope
    c. Develop engineering standards specification in conjunction with client (Thin Slice)
    d. Review change over strategy (Attend Shut Planning Meetings)
    e. Perform various HAZOP / Risk Assessment studies not only relating to people safety
    f. Revise FDS baseline by having interviews & workshops with clients to define "TO-BE"

Client (both production and engineering) involvement during the design phase is vital and ALL of the above must be approved by the client or its allotted representative prior to proceeding to any of the next phases. Cognizance must be taken of design drivers specified in section 4.1. The review process is covered in contractual documents.

3. Standards Development Phase (Device Thin Slice):
    a. Client has existing standard S7-300 device library which will be free issued but may require limited customization for following devices:
        i. DOL Motor Starter with hardwired signals "Safe / Trip", "Indicate", "Manual Key Switch" and ON/OFF command from SCADA. Please note that differentiation is to be made between series wired E Stop & Manual in field to be split parallel for Arc Furnace only (+/- 32 drives). Typical examples of DOL: Pump, Fan, Vibrating Motor, Bucket Elevator, Conveyor, Mixer.
        ii. VSD Motor Starter with hardwired signals "Safe / Trip", "Indicate", "Manual Key Switch" along with Speed Reference to VSD and ON/OFF command from SCADA. Series signals to be split as above.
        iii. FLAP / SOLENOID Control with 1/2/3 position feedback signals
        iv. ANALOGUE IN scale block & ANALOGUE PID Control
        v. Discrete signals do also exist which are not associated to a device

The revised blocks are to be documented and returned as the property of the client.

4. Software Development Phase:
    a. It is envisaged that the following “groups” / “sequences” will need to be engineered:
        i. “Cooling System”
        ii. “Granulation”
        iii. “Charge / Feed System”
        iv. “Tap Changer”
        v. “Electrode Hoist”
        vi. “Tilt / Tapping” (including Ladle / Matt Car)
        vii. “Transformer / Breaker”
        viii. “Maximum Demand”
        ix. “LPC”
        x. Power Totaliser
        xi. Batching
        xii. Miscellaneous controls such as duty standby, etc. are also to be developed

The standards developed will be based on the design and at no time will client be restricted to have access to any component there off including the purpose of re-using it. Full Factory Acceptance Testing will be required to act as sign off on the standard.

5. Pre Shut Phase (Hardware):
    a. Marking of wires not marked (Tenderer to provide samples of what will be used)
    b. Installation of “temporary components i.e. terminals, etc” phase (If deemed required)
    c. Manufacture / Install equipment which may be performed in parallel i.e. New JB, etc

6. Pre Shut Phase (Engineering):
    a. Design Interface between PLC and APC System (Envisage OPC type of connection)
    b. Engineering of PLC system, including integration of respective areas to one PLC
    c. PLC Engineering to cover:
        i. Hardware Configuration
        ii. Configuration of device types (Typical’s)
        iii. “Linking” of sequences as per specifications
        iv. Establish “temporary” communications to S5 PLC’s via Profibus along with APC
        v. Capturing of existing process set points and other critical values
    d. SCADA Engineering to cover:
        i. Modification of data base interface to S7 system for S5 converted tags
        ii. Modification of interfaces to Ethernet
    e. Factory Acceptance Testing and Simulation (interlocks & devices)
    f. Training of operators and technical staff (4 shifts, one 8 hour session per shift)
    g. Potentially confirmation of some of the key operations (against FDS)

It is vital to confirm any uncertainties in this phase since during shut it may no longer be possible.

7. Shut Phase:
    a. Commission and testing of new systems for performance trial period (5 days)
    b. Change out of temporary components to new system
    c. Renumbering of wires to reflect new standard (only in PLC enclosures)

The performance test criteria and measurement to be conformed to is explained in section 4.1.2.

8. Post Shut Phase:
    a. Updating of documentation and drawings to reflect AS-BUILT status
    b. System optimization (please allow for an additional man week on site support after handover)
    c. Safe decommissioning of spares to store (properly packaged and marked)

CLIENT has not allowed for a budget amount to redo the SCADA other than for modification of the interface.

It is important to note that during the aforementioned process **tenderer will have to interface to various 3rd parties**. Note that CLIENT reserves the right to delegate some of the project management and quality control (QC) tasks to a specialist 3rd party. The system integrator will be expected to work in conjunction with this allotted entity to ensure joint positive outcome of the project.

1.2.2 Equipment

The scope of equipment supply broadly covers the following topics as defined within:

1. Supply and equipping of new IO marshalling enclosures (see point 2 below)
2. Supply of interposing fused type relays, indicating fuse terminals, etc
3. Supply of supporting shielded cable conduit and new fiber optic network cables (12 core)
4. Supply of supporting cable racking for re-routed signal cables along with multi core cabling between ET station and new IO marshalling enclosure (Arc Furnace only)
5. Supply of Siemens **hot swappable** ET200M hardware for following areas:
    a. Arc Furnace PLC and Blending PLC
6. Supply of Profibus and Ethernet Networking Equipment for IO and SCADA integration
7. Supply of some instrumentation
8. Supply of commissioning spares (included in spare IO count already)

1.2.3 Overheads

The following are envisaged required over and above tools / equipment required to do the works:

1. Provision to be made for medical and induction costs

Note that the client has one scaffolding tower along with Cherry Picker available and only a licensed operator may utilize this.

1.3 Base Line Documentation

The following documents will form the basis of the design and enquiry:

1. This enquiry containing:
    a. Listing of envisaged devices and sequences (please refer to paragraph **1.2.1**)
    b. Proposed Equipment for standardization (please refer to paragraph **4.18.1**)
    c. IO Counts (please refer to paragraph **1.3.1**)
    d. Proposed Panel Layout (please refer to paragraph **4.19**)
    e. Proposed System / Network Layout (please refer to paragraph **4.3**)
    f. Proposed Change Over Plan (please refer to paragraph **4.4**)
    g. Performance Specification (please refer to paragraph **4.1.1**)
    h. Quality Specification (please refer to paragraph **4.17**)
2. Price format detailing in which format tender should respond (Separate addendum)
3. Copy of previous Audit documents Successful Tenderer Only!

Please be advised that a survey was undertaken on the Furnace area only in approximately 1999 of which the outcome is some limited base line documentation to be provided to successful tenderer. Typically this includes an FDS and IO listing but no drawings! It is felt that this should result in some form of saving to CLIENT and this should subsequently be reflected in the proposal.

1.3.1 IO Counts

The Arc Furnace PLC consists out of the following Input / Output (IO) count:

Table 1: Arc Furnace PLC (Current IO)

Description	Exist	Extra	Hardware (20% Sp)	Spare	Engineering
Digital Inputs	160	64	288	57	167
Digital Outputs	168	0	224	18	150
Analogue Inputs	80	0	96	13	67
Analogue Outputs	16	0	20	6	10
Sub Total	424	64	628	94	**394**

Please take note of the following considerations:

1. The existing IO count is indicated above
2. Note an additional 64 digital inputs must be allowed for to enable differentiation between E Stop and Manual in field.
3. The above listing includes additional 20% spare IO required on top of existing IO count
4. Presently a combination of signal levels is used however it is the intention to standardize on fewer signal types as far as the PLC IO is concerned by use of interposing relays and high density modules. This is also been rounded up in the hardware count.
5. The amount as indicated in the hardware column states required IO signals to be allowed for from a hardware perspective. This ensures no commissioning spares are required.
6. IO which will become spare once mimic panel has been removed is also estimated
7. The integrator is to only allow for engineering IO as per engineering column.
8. Spare allocation should be allocated on a per area basis.

Table 2: Blending PLC (Current IO)

Description	Exist	Extra	Hardware (20% Sp)	Spare	Engineering
Digital Inputs	286	0	352	18	268
Digital Outputs	128	0	160	22	106
Analogue Inputs	24	0	32	6	18
Analogue Outputs	0	0	0	0	0
Sub Total	438	0	544	46	**392**

Please take note of the following considerations:

1. The existing IO count is indicated above and no additional IO is required.
2. The above listing includes additional 20% spare IO required on top of existing IO count
3. Signal levels are standardized on fewer signal types as far as the PLC IO is concerned. This has also been rounded up in the hardware count.
4. The amount as indicated in the hardware column states required IO signals to be allowed for from a hardware perspective. This ensures no commissioning spares are required.
5. IO which is spare is also estimated
6. The integrator is to only allow for engineering IO as per engineering column.
7. Spare allocation should be allocated on a per area basis.
8. Please be advise space is restricted in this MCC

Please note that it is required that all hardware be installed and commissioned.

1.4 Process Object

To simplify the project in terms of estimating the size and for dealing with variations the concept of a "Process Object" (PO) is introduced. Essentially stand alone signals which are associated to a specific piece of equipment are considered as a process object or device. As a rule of thumb for this project it is assumed that at least every two (2) Input / output (IO) signals forms a process object.

1.5 Project Boundaries

The following items form the boundaries of the proposal:

1. Tenderer is responsible for the complete design (workable concept through to detail)
2. Tenderer is to supply all items required to complete project (refer to BOM for guideline)
3. Development of all standards / designs in conjunction and approval of client
4. Performing risk assessments (aimed at plant risks) and compiling change over plan
5. All associated engineering and FAT testing
6. Provision of training operator and technical training
7. Commissioning, optimization and decommissioning
8. Provision of documents

Please note that the scope is limited to the PLC & limited instrument replacement only. Electrical reticulation other than for signals and control voltages are excluded.

Please note client may wish to provide a competent resource to perform some of the deliverable works, on a reimbursable time and material basis at a flat rate per hour equal to the person's company cost to be deducted from contract amount.

1.6 Source Information

The table below makes reference of source information used to compile this document.

Table 3: Source Documents

No.	File Name	Description	Author
1.			
2.			
3.			

1.7 Acronyms

The table below makes reference to acronyms used throughout the document and provides a brief explanation there of.

Table 4: Abréviations

Abbr.	Explanation
ET	Extended Terminal (IO Station)
IO	Input / Output
IT	Information Technology
OPC	OLE for Process Control
PC	Personal Computer
PCS	Process Control System
PLC	Programmable Logic Controller
SCADA	Supervisory Control and Data Acquisition
UPS	Uninterruptible Power Supply

2. Document Sign-off and Distribution

Capacity	Name	Signature	Date
Client Representative			
Project Manager			

By signing the above all relevant parties agree that utmost care has been taken to ensure the correctness of this document.

CONFIGURATION MANAGEMENT

Rev	Date	Changes Made	Author	Approved

3. Current State

The current state for the respective areas of present scope is documented within.

3.1 Geographical Overview

A geographical overview is provided indicating areas which makes up the plant:

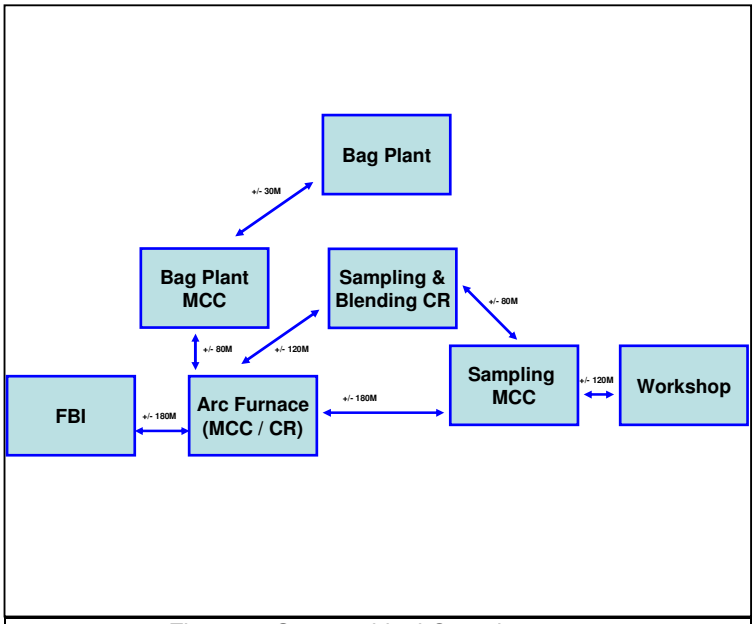

Figure 1: Geographical Overview

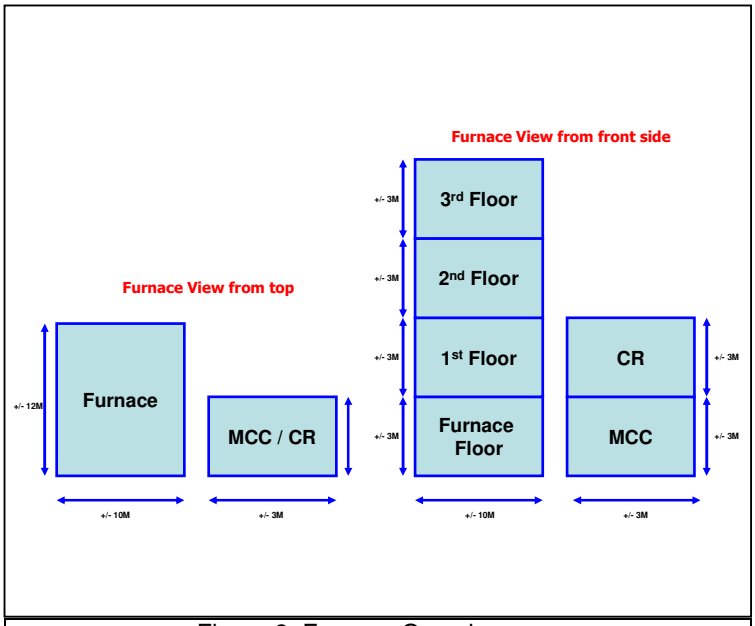

Figure 2: Furnace Overview

3.2 Topology

Current system topology is depicted below.

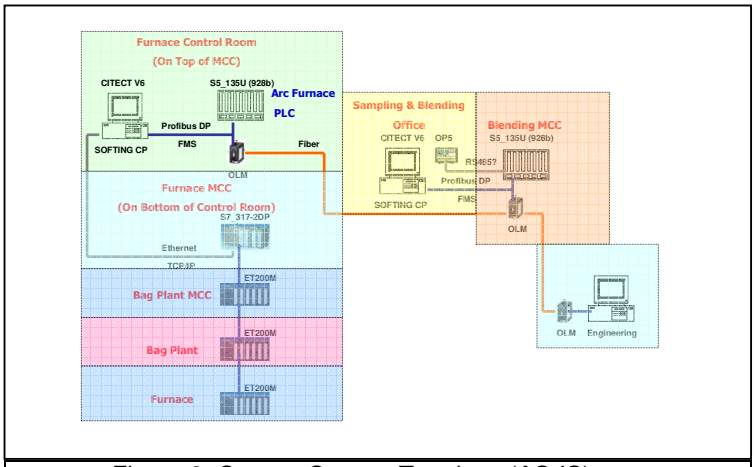

Figure 3: Current System Topology (AS-IS)

The above figure is discussed below from left to right, top to bottom:

A CITECT SCADA V6 (Server 1) is situated in the Furnace Control Room. It is connected via a copper Profibus FMS interface to the Arc Furnace Siemens S5_135U PLC (928B CPU) also situated in the control room. The same SCADA also communicate to a Siemens S7_300 PLC (317-2DP CPU) situated in the Furnace MCC below via a copper Ethernet interface. The SCADA is also connected to a second CITECT SCADA V6 (Server 2) situated in the Sampling and Blending Office via Fiber optic Profibus FMS connection.

The S7 PLC has three (3) ET200M stations connected to it via a copper Profibus DP network. These are situated in following areas:

1. Bag Plant MCC
2. Bag Plant
3. Furnace (not commissioned, but required)

SCADA Server 2 also communicates to the Blending Siemens S5_135U PLC (928B CPU) situated in the Blending MCC via a copper Profibus FMS interface. A Siemens OP5 operator panel situated in the Sampling and Blending office is connected to the Blending PLC via a copper Serial RS485 link.

The SCADA servers have a SOFTING 3rd party Profibus FMS communication module installed which enables it to communicate to the S5 PLC's. The license count is 1500 of which +/- 690 are utilized.

The engineering computer situated in the instrumentation workshop is connected to the PLC system via a fiber optic Profibus network to allow for "remote" programming.

3.3 Current Status

The current status of the installation is depicted below with some typical photos.

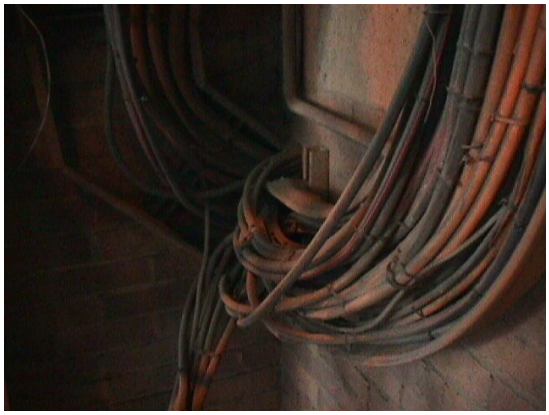

Figure 4: Example of poor cable installation

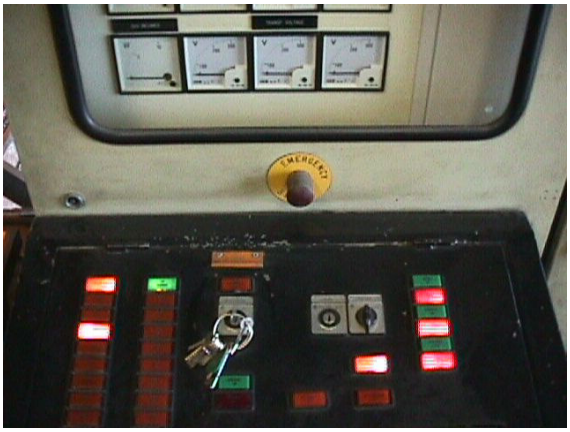

Figure 5: Both Furnace control room and panel is full

It is safe to assume that installation is of a poor standard with little or no numbering for the filed and also space is very restricted in most areas.

3.4 Existing Functionality

The following functionality currently is available within the system. Additional detail will be available in the Functional Design Specification (FDS) depicting current functionality to be provided to contractor.

Please note only Arc Furnace is depicted.

4. Scope

The scope is documented within.

4.1 Required High Level Functionality / Design Drivers

A short synopsis of the envisaged high level functionality is provided within. These are some of the design drivers which must be considered through out the design and development:

1. System must be no less functional than currently available and must not inherent any deficiencies from previous configuration and typically:
    a. Design must be modular so it may easily be expanded
    b. Alarming must be improved (By splitting serially connected signals)
    c. Navigation and tag naming must be improved
2. Design must cater for maximum up time but by using least amount of components possible
3. Design must cater for ease of maintenance and should not by default require 1st line support from system integrator
4. All system components to be designed for a nominal live span of **10 years** from handover
5. Tenderer is to show innovative methods in which they can add value to client

4.1.1 Performance Specification

The following metrics will be used to gauge if the system is delivering on the design drivers. Please note some philosophies may be applicable to more than one category.

Table 5: Engineered Functionality Metrics

No	Applicable Philosophies
1	New Control Philosophy to be adopted (Resistance Controlled via APC)
2	Existing modes of operation and control to be available along with new mode as required for above
3	System should prompt operator prior to allowing manual intervention to take place
4	Interlocks to be latched on a FIFO basis as to prevent random actions
5	All signals should be de-bounced for a time to avoid sporadic signals
6	The correct scan cycle times must be used based on functionality
7	Full functionality including diagnostic functionality has to be implemented through out the software
8	First use the automatic functionality provided by the system and only if this is required and not available then generate bespoke software
9	The software should be transaction based as apposed to continuous or pure sequential software i.e. code efficiency
10	Devices and sequences are to be grouped logically based on S88/95
11	As a standard: Alarming, Trending, Reporting and Security must be provided for as quantified
12	All software must be written fail safe to protect people, equipment and product

13	Software should be as standardized as possible with a consistent structure
14	Version / revision control needs to be built into the engineering
15	Same look and feel to allow for minimized operator training

Table 6: Maximum Uptime Metrics

No	Applicable Philosophies
1	All interlocks must be displayed and must be easily interpretable
2	Full functionality including diagnostic functionality has to be implemented through out the software
3	"Operate by exception" Principle i.e. were operator must not be flooded with unnecessary alarms i.e. if equipment is al ready stopped due to an interlock then alarming should be suppressed
4	No control should be done in the supervisory system in the event that the PC should fail
5	Aim to reduce number of components in series in the system based on the formula: Reliability = Item 1 x Item 2 x Item 3 (reliability) i.e. Reliability = 99% x 99% x 99% = 97%...
6	Any one part of the system may fail resulting in that part of the associated system failing. No doubling up on any component is required to improve availability.
7	Networks used for different functions are to be segregated at ALL times preferably physically. Were this is not possible a single suitable firewall may be used but with permission from IT department
8	Preferably MCC and IO networks are also to be kept separate unless otherwise specified.

Table 7: Ease of Maintenance Metrics

No	Applicable Philosophies
1	ALL relevant information to be provided to the correct person at the correct time in the correct format in real time
2	Libraries are to be used extensively (preferably those offered by System)
3	Software should be as standardized as possible with a consistent structure
4	The software must be re-useable hence must be modular
5	Clearly define and document all interfaces that exist
6	Avoid indirect addressing within the software at all times
7	All alarms including system alarms are to be "latched" at source on the first in first out concept
8	Work symbolic as far as possible hence avoiding absolute addressing
9	Full functionality including diagnostic functionality has to be implemented through out the software
10	First use the automatic functionality provided by the system and only if this is required and not available then generate bespoke software
11	The code needs to further be structured in such a way that the use of a programming device should not be required by default to perform fault finding
12	Version control needs to be built into the engineering along with fully commented code
13	No section of code is to be password protected
14	Devices that provide error display relay outputs should be connected to Lights marked: "FAULTY"

4.1.2 Performance Measurement

In order to achieve sign off per are the following metrics will need to be satisfied for a continued period of five (5) consecutive days, failure of which will result in a restart of the performance testing period for a further five (5) consecutive days. A maximum of three (3) attempts will be allowed before conditions of contract may be invoked.

Table 8: Performance Metrics

No	Applicable Philosophies
1	Envisaged CPU average scan times (inclusive of each interrupt) are to be estimated / calculated and is to be set as base lines for comparison to actual scan times. Should the set point be exceeded for a period of two seconds or three times per minute then error should be set / counter incremented. Example: Set point for "Free cycle – OB1" = 50mS. If actual scan time exceeds this continuously for a period of two seconds or this is exceeded three times in a minute then error is set. The premise is that a programming or configuration fault is present in the system which may have negative influence on the process… It may be advisable to indicate relevant information on scan time on SCADA i.e. average scan time vs. set point, last cycle scan time, longest scan time, no of exceptions, etc…
2	A similar principle may be applied for inter PLC or 3rd party communications i.e. where the number of time outs are recorded per minute. If this exceeds five (5) then error should be flagged / counter incremented. Were possible diagnostics provided default by equipment may also be considered, provided it does not impair goal of what is to be achieved and reduces engineering effort.
3	All equipment that is capable of providing diagnostics should be interrogated to determine if errors are "internal" since this may indicate a configuration fault. These are to be recorded and totalised over a minute period. If same "source" device signals more than five (5) similar faults per minute then error should be set / counter incremented. The premise is that while the user / engineer do not have control over external faults it is vital to eliminate configuration errors. Statistics of this should be presented on SCADA.
4	The concept must also be applied to SCADA equipment in that scripts are monitored for errors and flagged in a similar fashion.
5	The maximum average response time on the SCADA system for any action should be 2 seconds, accept for outputting reports or trends for which 10 seconds is deemed acceptable. This may be measured with a stop watch and must be recorded manually on system for KPI's.
6	The system must not generate more than 1 alarm every two (2) minutes with a maximum of 30 alarms per hour to allow operator time to respond. If this is exceeded error is to be set / counter incremented. These statistics are to be recorded.
7	No tests are required to ensure correct performance of archiving system used to capture or present trend data since this is considered a function of the system and configuration confirmed in FAT.
8	No tampering with performance mechanisms will be tolerated.
9	All statistics are to be stored per day for further analysis in sufficient detail. Resets should only be possible by user with sufficient password level as this will form basis of performance testing. Also during this phase no engineering station may be used without actions being witnessed by 3rd party.
10	If collective number of errors for one minute period exceeds three (3) then system should be deemed to under perform.
11	During the design phase it may be required to specify specific responses required for specific sections of the process.
12	Please note that the above performance test must not be seen in isolation and that design drivers along with required functionality as per FDS will also apply and be measured separately.

4.2 Geographical Overview

No geographical changes are envisaged, other than placement of enclosures in close proximity to existing locations and an allowance to incorporate to the new FBI project currently in process.

The following areas form part of the project scope:

1. Network (Fiber & Copper):
    a. PLC / SCADA (Control Network) – Ethernet
    b. PLC / ET Stations (Field Network) – Profibus
2. Arc Furnace:
    a. MCC
    b. Furnace Floor
    c. New Platform
    d. Bag Plant
    e. Bag Plant MCC
    f. Furnace Control Room
3. Blending:
    a. MCC
    b. Sampling & Blending Office
4. Instrumentation Workshop

4.3 Topology

The future state system topology is depicted below.

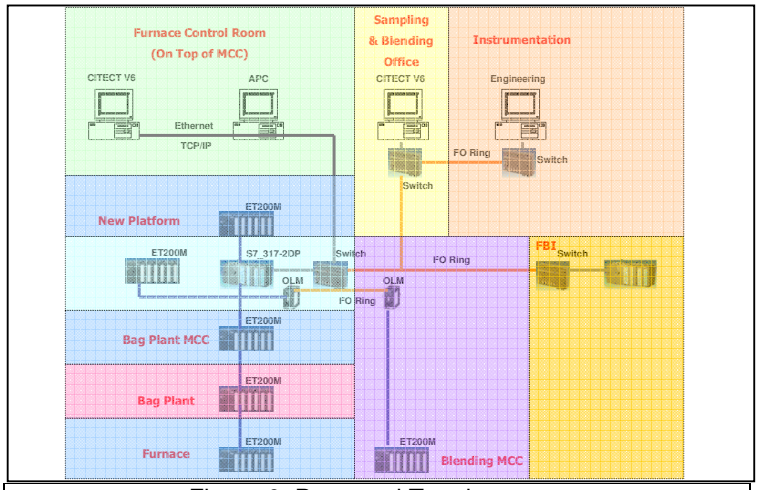

Figure 6: Proposed Topology

The above figure is discussed below from top to bottom, left to right:

It is envisaged that SCADA interface should be changed to Ethernet TCP/IP since it presumably is more future proof then Proprietary Profibus. Also this interface already works to one SCADA Server and theoretically will only require 2nd server to be modified to suit. (It is envisaged that during change out that new servers will be used.)

The new APC system is assumed to communicate via OPC Interface via Ethernet TCP/IP directly to the existing S7 PLC but will require some form of data validation to be engineered. It is envisaged network switches will be required for this. The existing OP5 is to be decommissioned and functionality to be built into the SCADA system. (Mainly consist out of sampling routine and time settings).

From the engineering PC in the instrumentation office it should to be possible to program both the SCADA and PLC remotely. To perform this network switches is envisaged as required along with the required licenses.

To facilitate the new topology it is also envisaged that a new fiber optic backbone will be required to be installed. This is to be in the form of a redundant ring. While not part of the existing system it is required to also link the SCADA to the FBI PLC.

The existing S5 PLC's is to be migrated to ET200M remote IO racks for both the Blending and Arc Furnace. The major consideration is the re-routing of IO signals as discussed within the detailed scope specifically for the Arc Furnace.

It is envisaged that the new OLM's may be used to establish a Profibus DP ring between Blending and Arc Furnace. It is envisaged new fiber optic ring is to be installed for this. The existing OLM's may then be used for inter S5 / S7 communications to facilitate the migration.

Interfacing from the SCADA to higher order systems is currently envisaged to be excluded. It is however required to maintain connectivity to the existing IT infrastructure.

4.4 Proposed Approach

A risk adverse strategy is to be followed for the project. The high level envisaged process is detailed within. Please be advised that this is only a recommendation and client may consider alternatives offered. Also note that **space & time is limited** and that **status of installation** is not ideal. The following high level process is along with critical steps are envisaged:

1. Clarification Phase
2. Standards Establishment Phase with "Thin Slice" testing and specification
3. Panel manufacture and software engineering phase concurrently
4. Factory Acceptance Testing
5. HAZOP Phase (specifically clarification of unknowns
6. Installation and Commissioning including optimization and training (on an area by area basis).
7. Hand over documentation
8. Optimization
9. Decommissioning

Proper utilization of pre-shut / maintenance days is advised for clarification purposes and also to identify / mark components or installation of temporary components or to record critical settings.

4.4.1 Shut Planning

The successful tenderer will have the following access to the plant to perform the migration:

1. Arc Furnace PLC
    a. 8 hours every 2nd week on a Tuesday
2. Blending PLC
    a. 8 hours every week on a Wednesday

Taking the above constraints (excluding load shedding) into consideration the successful tenderer will have +/- 6 pre-shut days for Arc Furnace and +/- 12 pre-shut days for Blending (normal time 08:00 to 17:00) and +/- 14 shut days (extended days i.e. 24hrs) available to complete the shut assuming project is awarded 29 February 2008 and must be completed by 30 June 2008.

A late start with an early finish should be anticipated and planned for accordingly.

Please note that since Blending PLC has more shuts and generally speaking is in a better condition in terms of its status and documentation it may be beneficial to start with this PLC 1st

4.5 Control Network (PLC / SCADA)

The aforementioned topic is discussed within.

4.5.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. 1 x Siemens X204-2 (100Mb) Scalance Ethernet Switch at following locations:
    a. Arc Furnace MCC
2. 1 x Siemens X202-2IRT (100Mb) Scalance Ethernet Switch at following locations:
    a. Sampling & Blending Office
3. 1 x Siemens X204-2 (100Mb) Scalance Ethernet Switch at following locations:
    a. Instrumentation Workshop
4. 2 x Siemens 220Vac(in) 24vdc/5A(out) SITOP power supplies, Cabling (+/-5M) at locations:
    a. Arc Furnace MCC
    b. Sampling & Blending Office
    c. Instrumentation Workshop
5. Wall mount, IP55 fiber glass panel with 2.5mm^2 Weidmuller terminals, MG circuit breakers, etc for Workshop equipment (400x400x200). Beige IP55, Bottom Entry, Glass cutout, lockable.
6. 2 x 3M equipped splice box for following locations (one for in & one for out):
    a. Arc Furnace MCC
    b. Sampling & Blending Office
    c. Instrumentation Workshop
    d. FBI
7. 12 core heavy duty multimode glass fiber optic cable for following source / destinations:
    a. From Arc Furnace MCC to Instrumentation Workshop +/- 300M
    b. From Instrument Workshop to Sampling & Blending Office +/- 200M
    c. From Sampling & Blending Office to Arc Furnace MCC +/- 120M
    d. From Arc Furnace MCC to FBI +/- 180M x 2
8. Conduit containment for aforementioned cabling
9. Pre manufactured fiber optic fly leads (+/-5M) for ALL used switch ports connections
10. Pre manufactured CAT 6 Cables for following connections:
    a. PLC (+/-2M)
    b. Server 1 (+/-15M)
    c. APC PC (+/-15M)
    d. Server 2 (+/- 5M)
    e. Engineering PC (+-5M)
11. Labeling

4.5.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Design of enclosures, network routes and cabling schedules (approved by client)
2. Off Site equipping of enclosures to be supplied
3. Panel FAT testing Off site (Quality Control Hold Point)
4. Installation of enclosures & cable containment (final routes / positions agreed with client)
5. SAT testing prior to cable installation (Quality Control Hold Point)
6. Cable installation
7. Splicing (ALL cores either to spare ST connector in 3M enclosure or to mid couplers)
8. SAT testing of splice reports
9. Installation of fiber fly leads to switches
10. Installation of CAT 6 fly leads to PC's / PLC
11. Labeling
12. Update AS BUILT documentation and drawings, inclusive of recovery documentation
13. Provide technical training (fault finding)
14. Decommissioning of redundant cables

4.5.3 Special Considerations

Please consider the following:

1. Required network modules & licenses are covered under respective areas
2. Allowance must be made for temporary network connection between S5 PLC and S7 most likely by making a connection via Profibus and using existing infrastructure.
3. Unless otherwise specified equipment will be housed in existing enclosures
4. Its envisaged that network can be installed without plant interruption requiring only a short shut
5. The FBI project is currently underway and it is required to install a Fiber ring between it and Arc Furnace.

4.5.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 9: Sizing Information – Control Network

Description	Project
No of Scalance Switches	**3**
Fiber Ports	2
Copper Ports	10
No of PSU	6
Panel Enclosures	**1**
3M splicing enclosures	**8**
Estimated FO Cable Length	**+/-980M**
5M Fiber Optic Fly Leads	**6**
CAT 5 Cables	**5 (42M)**

Savings / Re-Use:

It is assumed client will not have to bear the costs for temporary network components as tenderers are assumed to have these components readily available and to remove it again once complete. At best client may be willing to pay a once of flat fee for "hiring" the components provided costs do not exceed purchase price.

4.6 Field Network (PLC / ET's)

The aforementioned topic is discussed within.

4.6.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. 1 x Siemens G12 OLM Profibus Media Converter at following locations:
    a. Arc Furnace MCC
    b. Blending MCC
2. 2 x 3M equipped splice box for following locations:
    a. Sampling MCC
3. Pre manufactured fiber optic fly leads (+/-5M) for ALL used switch ports connections
4. Pre manufactured copper cables (+/-5M) with DP Plugs for following source / destinations:
    a. PLC / OLM
    b. ET / ET
    c. OLM / ET
5. Labeling

4.6.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Design of enclosures, network routes and cabling schedules (approved by client)
2. Off Site equipping of enclosures to be supplied
3. Panel FAT testing Off site (Quality Control Hold Point)
4. Installation of enclosures (final positions to be agreed to with client)
5. SAT testing prior to cable installation (Quality Control Hold Point)
6. Installation of fiber fly leads to OLM's
7. Installation of copper fly leads to PLC / OLM's / ET
8. Labeling
9. Update AS BUILT documentation and drawings, inclusive of recovery documentation
10. Provide technical training (fault finding)

4.6.3 Special Considerations

Please consider the following:

1. Required network modules are covered under respective areas
2. New Profibus OLM's are recommended since it is envisaged exist OLM's will need to remain for temporary network between S5 and S7 PLC's. Once upgraded these will become spare.
3. No additional fiber optic cables are deemed required, spare cores on new cable will be used
4. Unless otherwise specified equipment will be housed in existing enclosures
5. Its envisaged that network can be installed without plant interruption requiring only a short shut

4.6.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 10: Sizing Information – Field Network

Description	Project
No of OLM's	**2**
Fiber Ports	2
Copper Ports	1
DP Plugs	**7**
3M splicing enclosures	**1**
5M Fiber Optic Fly Leads	**4**
DP Cable	**2 (10M)**

4.7 Arc Furnace MCC

The aforementioned are is discussed within

4.7.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Furnished back plate with 2.5mm^2 terminals, quick connect Weidmuller relays / Omron relays as required for IO / Power along with ET200M IO modules (+/- 32 x 4 digital input signals for E Stop / Manual / Isolate & Trip, 32 digital output signals, 2 VSD, incomer and +/- 13 transducers) and power supplies
2. 4 x 42 core multi core cables between MCC and ET station (1mm^2, twisted pair, individually and overall screened, numbered cores) +/-15M
3. 2.5mm^2 Marshalling Terminals for MCC (+/- 27 x 3 digital signals plus +/- 17 analogue signals) and required 1mm^2 signals wire (red, black, violet, white, orange, earth)
4. Replace following instrumentation:
    a. 3 x uncorrected primary line current transducers (0-5A / 4-20mA)
    b. 3 x primary line to line voltage transducers (0-250Vac / 4-20mA)
    c. 3 x secondary line to line voltage transducers (0-250Vac / 4-20mA)
    d. 2 x power consumption instruments (KWh meter via CT)
    e. 2 x power factor instruments (KWh meter via CT)

4.7.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Identify IO related to MCC (+/- 27 motors, 2VSD's, Incomer and +/- 13 transducers) which is to be relocated to MCC along with signals which are to be split for field / MCC trip differentiation
2. Design of back plate layout, cabling & wiring schedules (approved by client)
3. Updating of FDS against code / client workshop sessions
4. PLC engineering as per FDS (weekly progress required in the way of copy of backups)
5. Software FAT testing (Quality control hold point)
6. Back plate manufacture
7. Off site FAT testing (Quality control hold point)
8. Installation of multi core cables between MCC and ET station
9. Installation of multi core cables between "Breaker Room" and ET station
10. Installation of populated back plate (if required temporarily)
11. Modification of MCC signals to new terminals
12. Install new transducers / instruments
13. Risk assessment (Quality hold point)
14. Change over to new system in a phased approach (Tenderer to provide change over process)
11. Labeling
12. Update AS BUILT documentation and drawings, inclusive of recovery documentation
13. Provide training (fault finding)

4.7.3 Special Considerations

Please consider the following:

1. Existing cable trench may be re-used
2. It is the intention to standardize PLC control signals (not field) by means of interposing / quick connect type modular system (mainly 24Vdc and 4-20mA signals)
3. Each ET station will require its own rack power supply and one is required for control voltage.
4. Safety Circuits are to be split further into:
    a. Field E Stop
    b. Manual
5. Typical Bucket drawings does exist
6. Client prefers that marshalling is done at the back of the MCC
7. Main Fan Amperage is to be wired to PLC as an analogue input
8. Hot Swappable IO are to be used (orientation vertical which is not ideal for high temperatures)
9. Sufficient auxiliaries exist inside MCC

4.7.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 11: Sizing Information – Arc Furnace MCC

Description	Project
Analogue Measurements	14
Digital Measurements (I/O) – PO's	0
PID controllers	2
Motors	27
Valves	0
SFC & Steps (Sequences)	1 / 30
Digital Inputs	128
Digital Outputs	32
Analogue Inputs	14
Analogue Outputs	2
Process Objects (PO)	**+/- 43**
Archive Tags Required	+/- 43
No of IO modules	4DI/1DO/3AI/2AO
No of ET's & associated PSU	1 / 2
Enclosures	1
Multi Core Cables	4 x 15M (42c)
Instrumentation	13 off

SFC's

It's assumed 1 for sequence starting of motors.

Savings / Re-Use:

Feasibility to make use of existing IO for analogue signals is to be considered

4.8 Arc Furnace Control Room

The aforementioned area is depicted below.

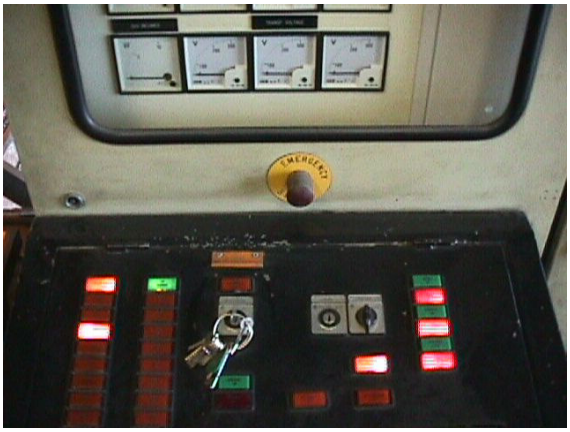

Figure 7: Arc Furnace Control Room

4.8.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Siemens Grey IP65 mild steel enclosure (+/-400x400x200) bottom entry with pedestal, lockable furnished with 2.5mm^2 terminals, buttons and lights complete with required 1mm^2 signals wire (red, black, violet, white, orange, earth)
2. New HP SCADA Server PC (minimum specification) with network cards and 17" monitor, etc

4.8.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Design of panel layout, cabling & wiring schedules (approved by client)
2. Panel manufacture
3. Off site FAT testing (Quality control hold point)
4. Design of network interfaces for SCADA & APC (specification approved by client)
5. Modification as required for SCADA to accommodate S7 Interface
6. Interfacing to APC
7. Installation of populated panel
8. Risk assessment (Quality hold point)
9. Change over to new system in a phased approach (Tenderer to provide change over process)
10. Labeling
11. Update AS BUILT documentation and drawings, inclusive of recovery documentation
12. Provide training (fault finding and operations)
13. Decommission redundant equipment from control room

4.8.3 Special Considerations

Please consider the following:

1. Furnace is 2.2Mva in size with power factor ranging between 0.8 to 0.5 lagging
2. Decommission meters (functionality to move to SCADA)
3. The tenderer may need to assist with placement of computer equipment if it is found that these may temporarily need to be relocated.
4. No IO counts are provided under this topic as this is handled else were
5. Temporary software if deemed required should be indicated by tenderer

4.8.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 12: Sizing Information – Arc Furnace Control Room

Description	Project
Enclosures	1
HP Server PC with monitor	1

Savings / Re-Use:

None

4.9 Arc Furnace New Platform

The aforementioned area is depicted below.

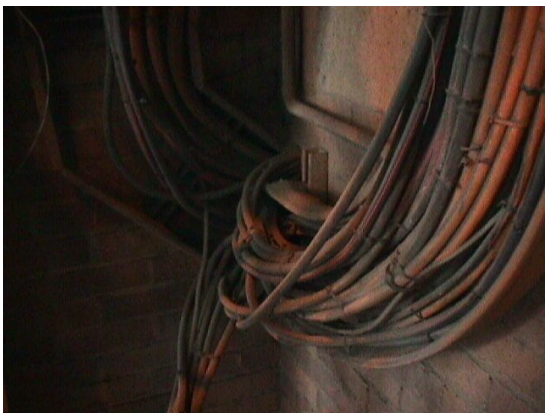

Figure 8: Arc Furnace New Platform

4.9.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Siemens Grey IP65 mild steel enclosure (+/-2000x1500x200) bottom entry with light and plug, lockable furnished with 2.5mm^2 terminals, quick connect Weidmuller relays / Omron relays as required for IO / Power along with ET200M IO modules and power supplies. Provision for DP cabling and plugs should also be made complete with required 1mm^2 signals wire (red, black, violet, white, orange, earth)
2. It's envisaged some cable racking may also be required however it is difficult to quantify at this stage.

4.9.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Identify IO remaining which is to be relocated to New Platform keeping in mind some signals will be moved to MCC while others will be decommissioned (typically the mimic interface)
2. Design of panel layout, cabling & wiring schedules (approved by client)
3. Updating of FDS against code / client workshop sessions
4. PLC engineering as per FDS (weekly progress required in the way of copy of backups)
5. Software FAT testing (Quality control hold point)
6. Panel manufacture
7. Off site FAT testing (Quality control hold point)
8. Installation of populated panel
9. Risk assessment (Quality hold point)
10. Change over to new system in a phased approach (Tenderer to provide change over process)
11. Labeling
12. Update AS BUILT documentation and drawings, inclusive of recovery documentation
13. Provide training (fault finding)

4.9.3 Special Considerations

Please consider the following:

1. It is proposed that existing cables be pulled back once disconnected from existing S5 PLC and be terminated in new enclosure. If to high a risk additional marshalling cable may be required
2. It was indicated by client that signals are mixed inside of some of the cables coming from the field. Note that no field tracing or audit work has been performed to quantify this.
3. The client will make mechanical / civil modification as required to make space to positions the new enclosure. This may have to be coordinated and require involvement from the tenderer.
4. It is the intention to standardize PLC control signals (not field) by means of interposing / quick connect type modular system (mainly 24Vdc and 4-20mA signals)
5. Each ET station will require its own rack power supply and one is required for control voltage.
6. Please be advised that the environment is less than ideal for equipment placement and during the design phase this needs to be considered
7. Hot Swappable IO are to be used
8. Please be advised that some of the signals driven by the PLC are high current output which may exceed the compact relay specification and subsequently may require more powerful relays (+/- 72 signals)
9. The feasibility to as a temporary measure to "double up" on the terminals may need to be considered if it is deemed risk is to high to simply cut back cable and re-terminate

4.9.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 13: Sizing Information – Arc Furnace New Platform

Description	Project
Analogue Measurements	53
Digital Measurements (I/O) – PO's	(103+118)/2=111
PID controllers	8
Motors	0
Valves	0
SFC & Steps (Sequences)	11 / 30
Digital Inputs	103
Digital Outputs	118
Analogue Inputs	53
Analogue Outputs	8
Process Objects (PO)	**+/- 172**
Archive Tags Required	+/- 172
No of IO modules	5DI/6DO/9AI/3AO
No of ET's & associated PSU	3 / 4
Additional DP plugs	3+1 (active)
Profibus Copper Cable	5M

SFC's

+/- 11 groups seem to exist.

Savings / Re-Use:

No savings could be identified and while it may be possible to relocate IO closer to field it is envisaged this would further increase costs due to extra work being required.

4.10 Arc Furnace Floor

The aforementioned area is discussed within.

4.10.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. 3 x Furnace Pressure Transducers, 100PA / 4-20mA (up to process interface)
2. 3 x 4 core individually and overall screened 1mm^2 instrument cable (15 Meters)

4.10.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Identify existing S7300 PLC IO to be commissioned (estimate 8 analogue in & 16 digital outs)
2. Generate FDS against client workshop sessions
3. PLC engineering as per FDS (weekly progress required in the way of copy of backups)
4. Software FAT testing (Quality control hold point)
5. Risk assessment (Quality hold point)
6. Change over to new system in a phased approach (Tenderer to provide change over process)
7. Update AS BUILT documentation and drawings, inclusive of recovery documentation
8. Provide training (fault finding)

4.10.3 Special Considerations

Please consider the following:

1. It is understood ET station has been installed and only requires engineering and commissioning

4.10.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 14: Sizing Information – Arc Furnace Floor

Description	Project
Analogue Measurements	8
Digital Measurements (I/O) – PO's	16/2 = 8
PID controllers	0
Motors	0
Valves	0
SFC & Steps (Sequences)	0
Digital Inputs	0
Digital Outputs	0
Analogue Inputs	8
Analogue Outputs	0
Process Objects (PO)	**+/- 8**
Archive Tags Required	+/- 8

Savings / Re-Use:

No savings could be identified.

4.11 Arc Furnace Bag Plant MCC

The aforementioned area is discussed within.

4.11.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Siliconics (SI360) – plug in module to allow for reading current
2. Varispeed (RVSDB310 600 230-9-S) - plug in module to allow for reading current

4.11.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Identify options to extract data from devices and generate specification (client sign off)
2. Generate FDS against client workshop sessions
3. PLC engineering as per FDS (weekly progress required in the way of copy of backups)
4. Software FAT testing (Quality control hold point)
5. Install interface modules
6. Risk assessment (Quality hold point)
7. Change over to new system in a phased approach (Tenderer to provide change over process)
8. Update AS BUILT documentation and drawings, inclusive of recovery documentation
9. Provide training (fault finding)

4.11.3 Special Considerations

Please consider the following:

1. Only current is required from unit and as such it is not ideal to make use of Profibus which will require mixing of ET stations with MCC devices or a dedicated network and hence local analogue inputs are to be used.
2. Note that only one of the drives is ever operational
3. It is understood spare analogue inputs are available to connect to devices

4.11.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 15: Sizing Information – Bag Plant MCC

Description	Project
Analogue Measurements	2
Analogue Inputs	2
Process Objects (PO)	**+/- 2**
Archive Tags Required	+/- 2

Savings / Re-Use:

No savings could be identified.

4.12 Arc Furnace Bag Plant

The aforementioned area is discussed within.

4.12.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. None

4.12.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. None

4.12.3 Special Considerations

Please consider the following:

1. System is to remain functional AS-IS

4.12.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 16: Sizing Information – Bag Plant

Description	Project

Savings / Re-Use:

Not applicable

4.13 Sampling and Blending Room

The aforementioned area is discussed within.

4.13.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. New HP SCADA Server PC (minimum specification) with network cards and 17" monitor, etc

4.13.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Design of Ethernet interface to PLC (approved by client)
2. Modification as required for SCADA to become standby server
3. Risk assessment (Quality hold point)
4. Change over to new system in a phased approach (Tenderer to provide change over process)
5. Labeling
6. Update AS BUILT documentation and drawings, inclusive of recovery documentation
7. Provide training (fault finding and operations)
8. Decommission redundant equipment from room

4.13.3 Special Considerations

Please consider the following:

1. Decommission OP5 (functionality to move to SCADA)
2. Temporary software if deemed required should be indicated by tenderer

4.13.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 17: Sizing Information – Sampling and Blending Room

Description	Project
HP Server PC with monitor	1

Savings / Re-Use:

None

4.14 Blending MCC

The aforementioned area is discussed within.

4.14.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Furnished back plates with 2.5mm^2 terminals, quick connect Weidmuller relays / Omron relays as required for IO / Power along with ET200M IO modules and power supplies inclusive of required 1mm^2 signals wire (red, black, violet, white, orange, earth)

4.14.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Design of back plate layout, cabling & wiring schedules (approved by client)
2. Generate FDS against code / client workshop sessions
3. PLC engineering as per FDS (weekly progress required in the way of copy of backups)
4. Software FAT testing (Quality control hold point)
5. Back plate manufacture
6. Off site FAT testing (Quality control hold point)
7. Installation of populated back plate (if required temporarily)
8. Risk assessment (Quality hold point)
9. Change over to new system in a phased approach (Tenderer to provide change over process)
14. Labeling
15. Update AS BUILT documentation and drawings, inclusive of recovery documentation
16. Provide training (fault finding)

4.14.3 Special Considerations

Please consider the following:

1. Space both inside the MCC and enclosures are deemed an issue
2. Some of the existing equipment may require to be relocated by tenderer to allow for space
3. Since ALL digital signals are already 24Vdc if no space is available then only 1st option may be to replace existing terminals with interposing relays.
4. Each ET station will require its own rack power supply and one is required for control voltage.
5. Drawings are said to exist
6. Hot Swappable IO are to be used
7. PLEASE NOTE IO COUNT IS TO BE CONFIRMED DURING SITE WALK!!!

4.14.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 18: Sizing Information – Blending MCC

Description	Project
Analogue Measurements	18
Digital Measurements (I/O) – PO's	(268+106)/2=187
PID controllers	0
Motors	Incl.
Valves	Incl.
SFC & Steps (Sequences)	3 / 300
Digital Inputs	268
Digital Outputs	106
Analogue Inputs	18
Analogue Outputs	0
Process Objects (PO)	**+/- 205**
Archive Tags Required	+/- 205
No of IO modules	11DI/5DO/3AI/0AO
No of ET's & associated PSU	3 / 4
Enclosures	0

SFC's

The following possible sequences were identified from the IO list:

1. Conveying (4 different lines)
2. Mixing / Blending / Batching
3. Sampling

Savings / Re-Use:

An engineering saving is expected as a result of the similarity between respective lines.

4.15 Instrumentation Workshop

The aforementioned area is discussed within.

4.15.1 Scope of Supply

The tenderer will be responsible to supply the following equipment:

1. Engineering package for SCADA
2. Engineering package for Siemens S7-300 PLC

4.15.2 Scope of Services

The tenderer will be responsible to supply the following services as per section **1.2.1**:

1. Reload Engineering Station

4.15.3 Special Considerations

Please consider the following:

1. One of the existing SCADA servers must be reloaded to become the engineering station.
2. Communication packages to allow remote engineering must also be allowed for

4.15.4 Information

The following information should be used to estimate the effort required and must be used as a basis for the proposal:

Table 19: Sizing Information – Instrumentation Workshop

Description	Project
Software packages	2

Savings / Re-Use:

None identified

4.16 Documentation and Drawings

The following documents as a minimum are to be provided in triplicate on CD:

1. Design / AS-BUILT Documents:
    a. System Layout
    b. Naming and Numbering Convention (for ALL components)
    c. IO & cable schedules
    d. Instrument Loop Drawings
    e. General Arrangement Drawings (Both equipment rooms and enclosure contents)
    f. Instrument Specification
    g. Interface specifications (APC, etc)
    h. Functional Design Specification (FDS)
    i. Cable Route Diagrams
    j. Standards Specifications
2. Maintenance Documents:
    a. Supplier Documents
    b. Recovery Documents
3. Operations Manual
4. Project Management Documents

No 3rd party tools must be required to view the documents and it should be published in Adobe (latest version). All documents must be formatted for optimal printing. Mass production tools to be handed in. All source documents are to be handed over.

4.17 Quality

Quality will form a vital part of the success of the project and it is expected that acceptable quality plan be developed jointly with the client. Tenderer is to make use of own internal QA/QC processes and templates unless otherwise specified. It is vital that as a minimum the following level of detail must be present in the respective design documents:

4.17.1 All documents

All documents must contain:

1. Plot frame to be used containing:
    a. Revision number and date
    b. Author and approver
    c. Client Company Name & Logo

4.17.2 System Layout Drawings

These drawings are use to present the system offered in a block diagram format

1. ALL Graphic symbols to be identified in a legend and to be drawn to correct aspect ratio
2. ALL objects to be labelled / market with a number as per the standard convention
3. Different printable colours should be used to avoid confusion of for instance different networks
4. Concepts should be easy to follow
5. Relevant explanatory details such as addresses, terminations, lengths, etc are to be reflected

4.17.3 Loop Drawings

These drawings are use to present the control loop in a block diagram format

1. ALL Graphic symbols to be identified in a legend and to be drawn to correct aspect ratio
2. ALL objects to be labelled / market with a number as per the standard convention
3. Different printable colours should be used to avoid confusion of for instance different networks
4. Relevant explanatory details such as addresses, terminations, etc are to be reflected

4.17.4 Cable Route Drawings

These drawings are use to present the proposed cable routes in a block diagram format

1. ALL Graphic symbols to be identified in a legend and to be drawn to correct aspect ratio
2. ALL objects to be labelled / market with a number as per the standard convention
3. Different printable colours should be used to avoid confusion of for instance different networks
4. Relevant explanatory details such as locations, addresses, terminations, length, cores, etc are to be reflected
5. Preferably the drawing should be done in relation to physical plant layout

4.17.5 General Arrangement Drawings

These drawings are use to present either the equipment room layouts or panel contents layout in a block diagram format.

1. ALL Graphic symbols to be identified in a legend and to be drawn to correct aspect ratio
2. ALL objects to be labelled / market with a number as per the standard convention
3. Different printable colours should be used to avoid confusion of for instance different networks
4. Relevant explanatory details such as locations, dimensions, etc are to be reflected
5. If the drawing shows the outside view of an equipment room it must be possible to relate it to the physical aspect

4.17.6 IO / Cable Schedules

These are typically spreadsheet based documents used to present connection detail in table format.

1. Columns for module type, address, tag name, description, rack, slot, terminals, wire number, signal level, default signal value, etc. Differentiate between old and new system…
2. Cable type, Cable & Core number, source / destination…

4.17.7 Instrument Specification

This is typically spreadsheet based document used to present instrument detail in a table format.

1. Depends on specific instrument but typically process interface along with electrical interface parameters

4.17.8 Naming and Numbering Convention

These are typically spreadsheet based documents used to present naming & numbering detail in table format.

1. Columns as per convention i.e. area number, equipment type, process area, instrument type, sequential number…
2. Table to be populated with all relevant detail for ALL the permutations…

4.17.9 Interface Specifications
These are typically text based documents used to present interface detail in custom format.

1. This is a custom document which addresses key concepts / philosophies i.e. what happens when communications fail, etc
2. Document also explains data interface specification

4.17.10 Standards Specification
These are typically text based documents used to present functional detail in custom format.

1. Plant Modelling / navigation concepts, colour conventions, alarming and messaging philosophies, control strategy / modes, security, symbols, etc…

4.17.11 Functional Specification
These are typically text based documents used to present functional detail in custom format.

1. Process overview (PFD / P&ID), equipment / device listing, software structure, group controls, inter PLC communications, interlocking, trending, reporting, etc
2. Differentiation is to be made between current state and future state.

4.17.12 Recovery Document
This document is a quick start up / recovery guide to ensure plant can be made operable in shortest time frame.

1. It is vital that this document be started not at the end but as the project is performed
2. Both screen grabs and text messages are to be used in correct sequence.
3. It is also advisable to make reference to specific sections in supplier documents

4.17.13 Operations Manual
This document will be used to train operators and should make it possible for new operators to quickly learn how to control the plant.

1. SCADA screens are to be placed in the text based documents with detailed explanation of what each button / action does on the system.
2. Were multiple steps are required these are to be documented as such

4.17.14 Maintenance Manual and Spares List
This document will be used to explain how to maintain items which require maintenance. Also to be listed are items required to be kept as spare parts to allow for repairs or maintenance.

1. All maintainable items must be identified
2. Maintenance and calibration procedures must be detailed per the aforementioned item
3. Required components to be kept as spares must be listed

4.17.15 Project Management Documents

The following documents are to be supplied to relevant level of detail to allow for project management at the contractually specified frequency:

1. Organogram depicting Roles, Responsibilities and Team Structures
2. Communication Plan depicting communication flows including Request for Information (RFI) process.
3. Admin Management Plan depicting Admin Processes and table of contents of documents to be filled
4. Safety Risk Assessment (focussed on people)
5. Change Over Plan depicting proposed methodology with pictures / photos
6. Request for Change (RFC) and Variation Order (VO) process
7. Quality Management Process
8. Back Up Management Process
9. Technical Risk Assessments (Extremely high level of detail required)
10. Project Plan (Level 3 detail) inclusive of team structure down to specific resources
11. S Curve and Cash Flow Sheet (per bi-weekly period)
12. Progress report, listing progress, budget, risk, quality and RFI, RFC, VO, etc
13. Detailed shut schedule revised daily down to 4 hour increments

Please note that the consultant's templates will be used as a departing point for the above. All timelines are to be documented with aforementioned processes.

4.18 Standards

The following standards exist formally or informally:

4.18.1 Hardware Standards

1. 6ES7 153-1AA03 (ET200M Interface modules) – high spec required
2. 6ES7 322-1BL00-0AA0 (32 channel digital output – 24Vdc)
3. 6ES7 321-1BL00-0AA0 (32 channel digital input – 24Vdc)
4. 6ES7 331-7KF02-0AB0 (8 channel analogue input)

Please note that unless recommended by tenderer none of the network switches must be configured as to allow for ease of replacement. Alternatively required memory modules need to be supplied. All panels are to allow for an additional 20% expansion. Cable racking is to be from O Line preferably.

4.19 Proposed Panel Layout

Please refer to document "Proposed ET Back plates" which quantifies IO calculations.

4.20 Specific exclusions

The following is expressly excluded:

1. Uninterruptible Power Supplies (UPS)