

TECHNICAL SPECIFICATIONS

Executive Summary

A power utility company needs to accurately measure the power produced and used by their power stations on a 24/7 basis. The EMDAS (Energy Metering and Data Acquisition System) has been developed as a standard for ESKOM over the past fifteen years. The EMDAS system was recently redeveloped using the latest technology available.

Based on our knowledge and experience in system integration of EMDAS Metering Schemes and a vast number of third party products/applications, we have the ability to seamlessly engineer and commission the control system as per the end user's specifications.

1 Scope of Supply

The control solution offered consists of the following:

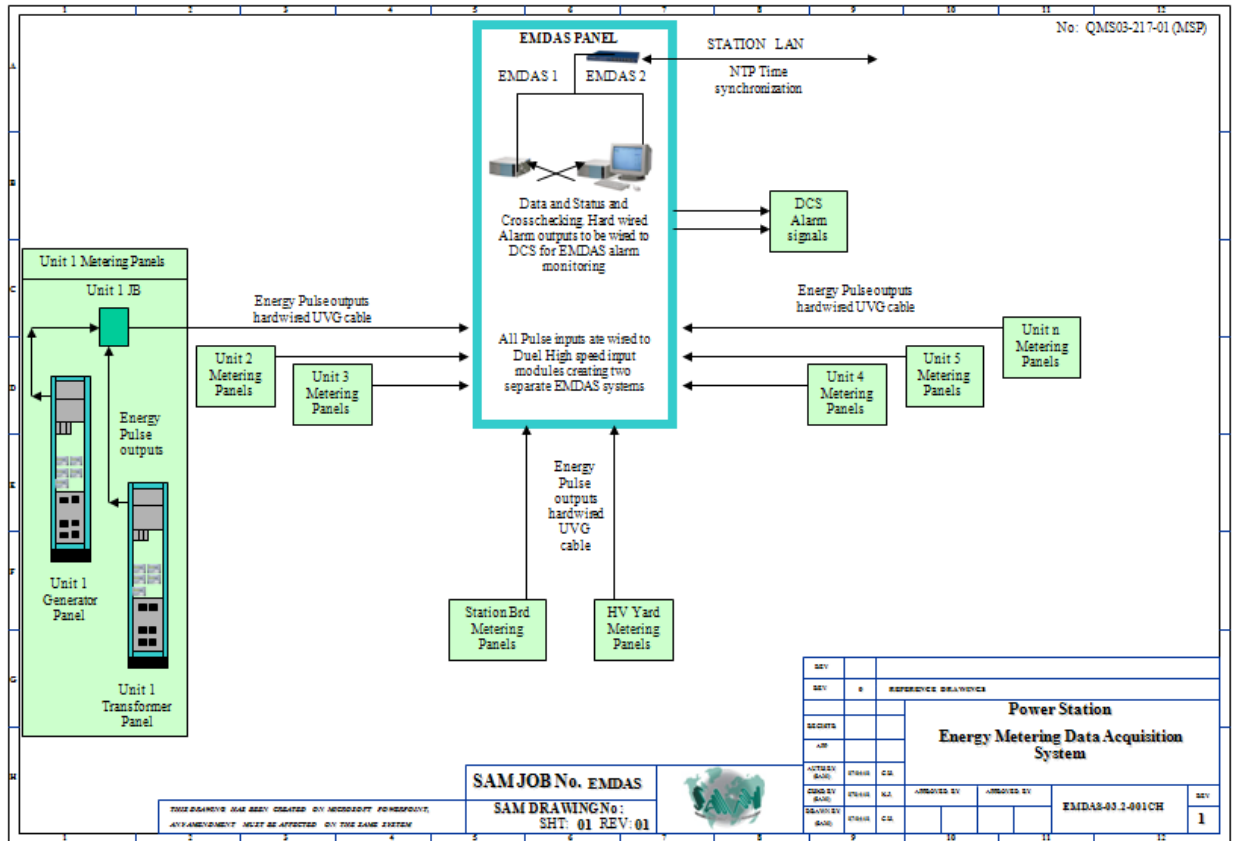
- EMDAS metering scheme for the counting of the Active and Reactive Energy pulses for the metering panels.
- Real time storage of input signal data for projection of hourly Energy data.
- Hourly storage of input signal data for historical storage.
- User defined signal calculation (e.g. summation, subtraction, multiplication, square root extraction, etc) can be used for group totals and energy losses etc.
- Comparison between Main and Check Meters with Alarm logging
- Scheduled FTP transfer of Power Station Energy to National Control Centre.
- Web based user interface for accessing energy data reports.
- Audit logging of all signal or configuration changes made.
- User Access level control.

2 Overview

Standard EMDAS metering Panel consisting of dual independent EMDAS systems. Pulse counting input modules standard 192 input's expandable on request to accommodate energy pulses with software pulse filtering and de-bounce to count the 80ms energy pulses Digital output module used for system cross checking and Alarm generation to station DCS.

All data is stored within the step 7 PLC controller card with 24hr rollover registers for hourly energy data backup that can be reloaded in case of communication failure – operating completely independently from the PC data server. The Dot Net based EMDAS server software running on the PC continuously monitors energy data on the controller storing current and hourly values into the Microsoft SQL database. Automated FTP file transfer of hourly values is generated and transmitted on the ESKOM LAN to the National Control server.

Automated data verification by software and hardware hand-shaking and data comparison between the two EMDAS systems continually verifies data and System integrity between Main and Check energy meters and EMDAS 1 and 2 data generating System. Audit and Alarm data logs into the SQL server database. Hard-wired alarms are provided to the DCS / Station SCADA.

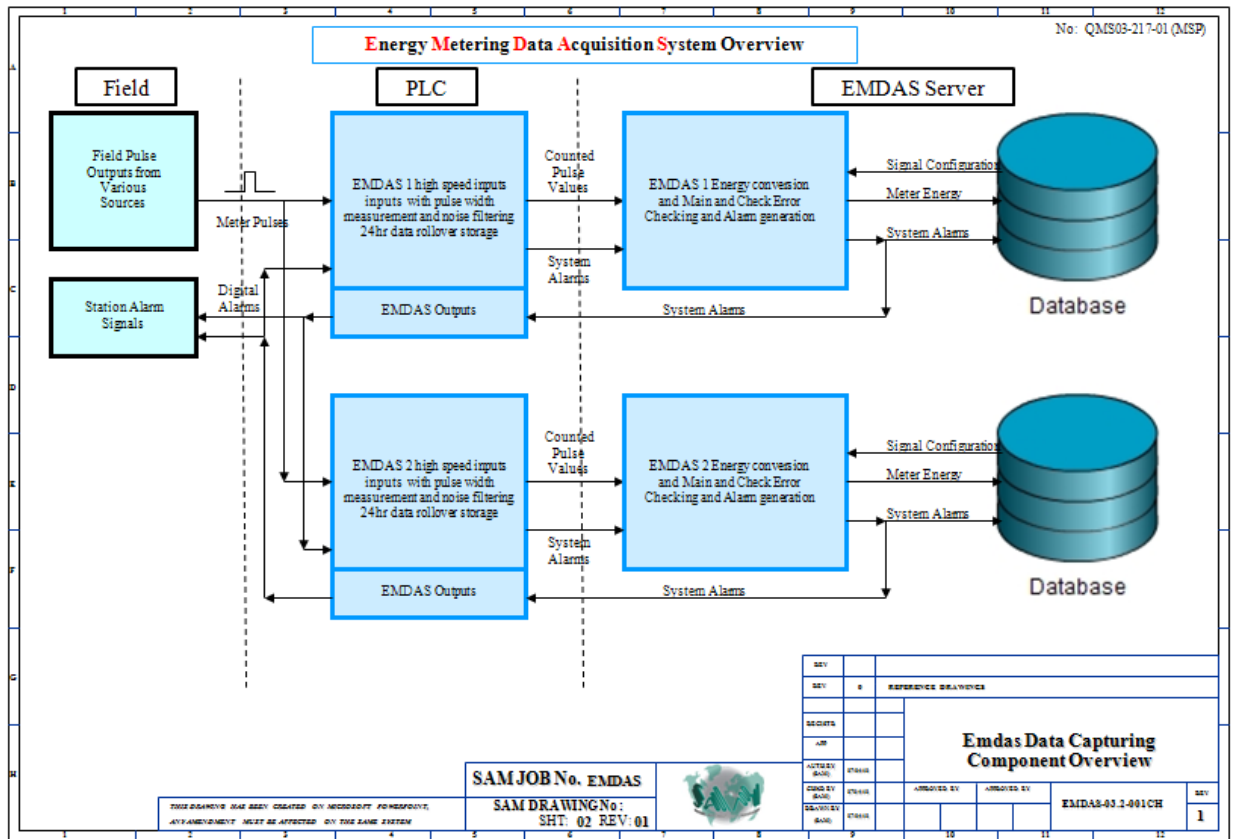


Hourly and Daily Energy reports can be viewed and printed. Data storage is only limited by hard disk space and is therefore basically unlimited

Hard wiring of the input Energy pulses is based on a centralized EMDAS connection to metering panels by UVG cables.

Remote users gain access to the EMDAS Web server via the ESKOM LAN.

3 Data Capturing Overview

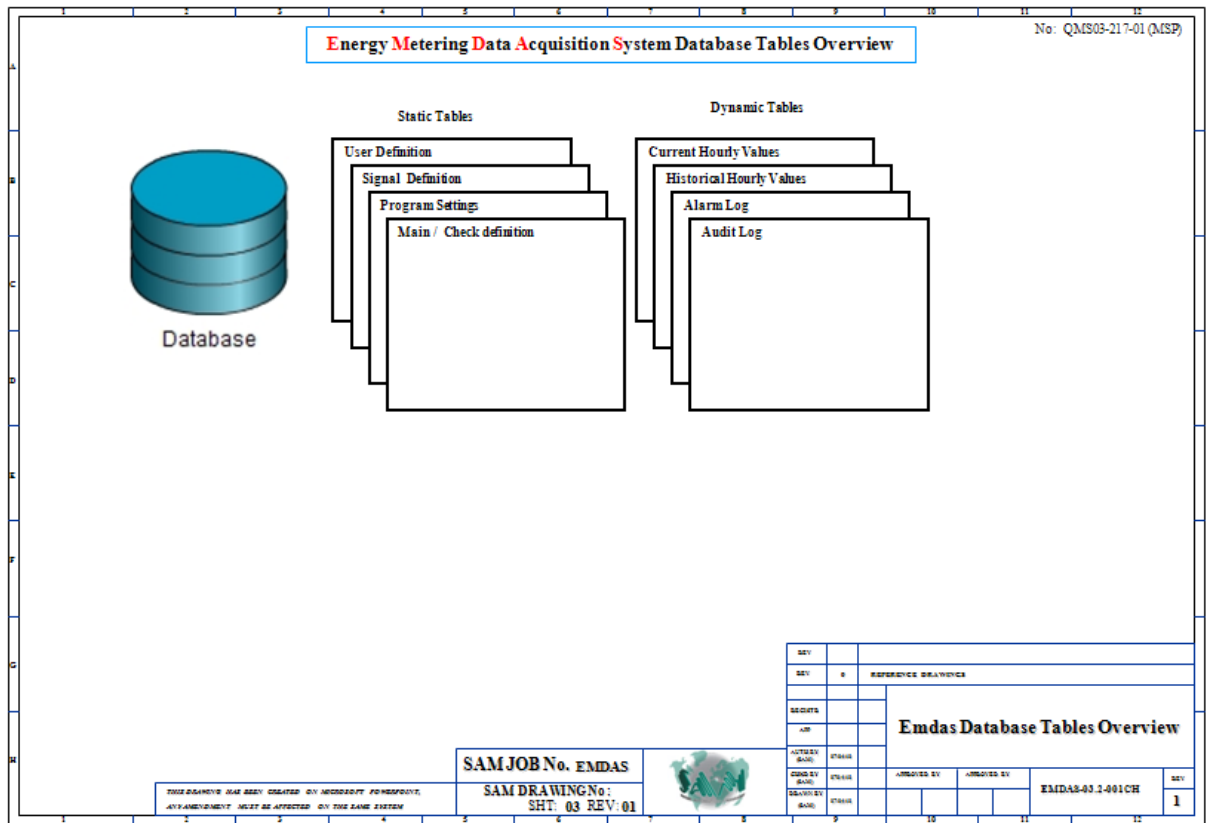


Energy measurement is done in the field by off the shelf Energy Meters providing field indication and storage of values. Pulse outputs are used to provide real time data for the EMDAS PLC. The width of the pulses in the pulse train, are continuously monitored filtering out unwanted noise. Data is stored in the current hour data block and rolled over on a hourly basis into the 24 hour data blocks. Time syncing is achieved through a NTP time server setup on the EMDAS server PC.

EMDAS server time sync is done to the station NTP server. There is a continuous upload of the current hour data from the PLC into the database. Hourly data is uploaded and stored for historical purposes. User defined calculations are done and results stored with the hourly data.

System errors (e.g. Power failure, program failure etc) and main check comparison errors are logged into the database. Audit log is kept of scheduled tasks run successfully and alarm's logged when necessary.

4 Database Table Overview



The data base can be broken up into two subsections namely Static and Dynamic tables. Table relations are setup linking signal configuration to the stored data and users to signal or configuration edits done during operation.

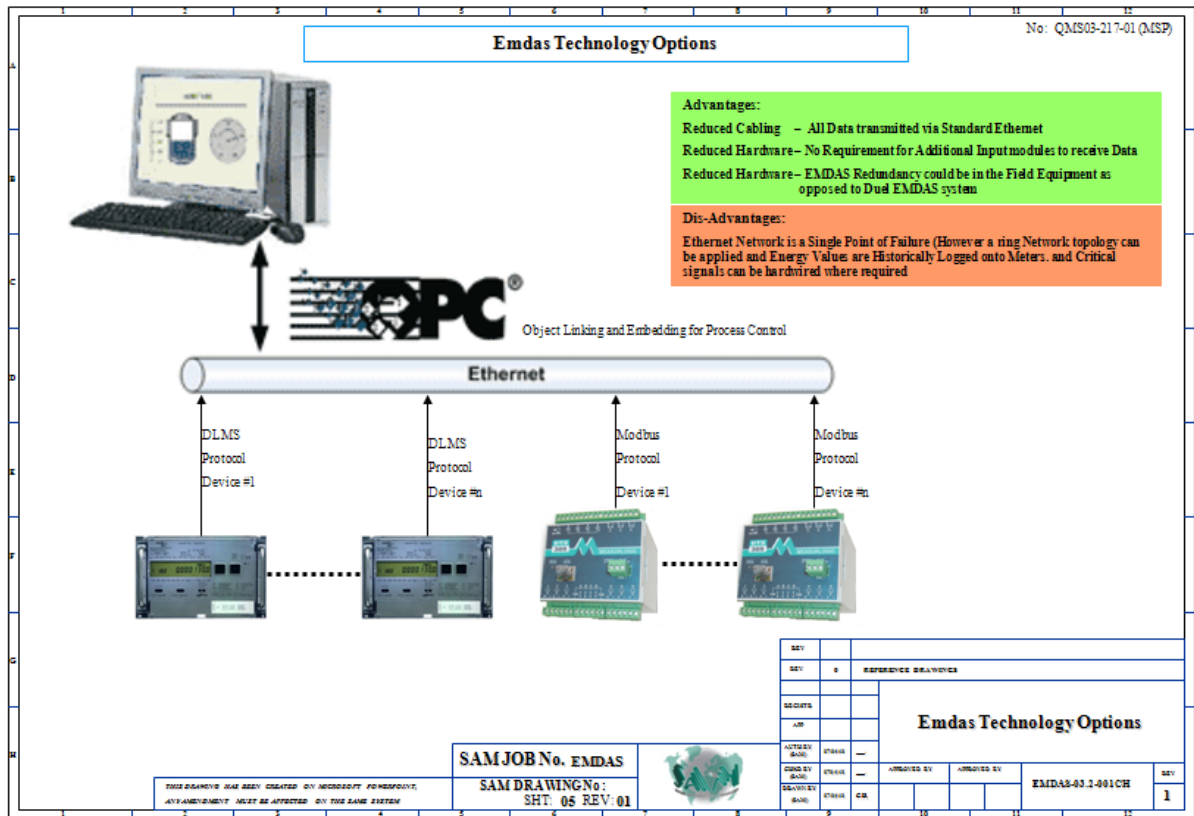
In the case of problems with the EMDAS values or the EMDAS system faults there is an alarm indication on the screen. Hard wired alarm is also sent to the DCS. The alarm may be acknowledged but can only be cleared when the fault is corrected and a action taken has been logged.

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Page 1 Page 2 Page 3 Page 4 Page 5 Page 6

GENERATORS	Gen 1	Gen 2	Gen 3	Gen 4	Gen 5	Gen 6
22KV						
Gross Gen MWh (Main Exp)	656.00	653.40	660.80	700.40	688.00	695.40
Gross Gen Mvarh (Main Exp) Lag	143.61	167.69	155.71	068.81	000.00	086.90
Gross Gen Mvarh (Main Imp) Lead	000.00	000.00	000.00	000.00	000.00	000.00
Gross Gen MWh (Check Exp)	656.00	653.80	660.80	700.80	688.20	695.00
Gross Gen Mvarh (Check Exp) Lag	000.00	000.00	000.00	000.00	000.00	000.00
Gross Gen Mvarh (Check Imp) Lead	000.00	000.00	000.00	000.00	000.00	000.00
Gross Nett Generated MWh (Sendout)	600.74	590.08	606.94	649.04	639.96	646.12
Gross Nett Generated Mvarh (Sendout)	143.61	122.67	120.29	033.13	-34.02	054.36
Unit Average Loading	598.20	550.90	548.19	680.24	574.83	591.92
UNIT TRANSFORMER 1	Unit 1 Trfr 1	Unit 2 Trfr 1	Unit 3 Trfr 1	Unit 4 Trfr 1	Unit 5 Trfr 1	Unit 6 Trfr 1
22KV						
Gross Trfr 1 MWh (Main Exp)	032.02	026.02	029.38	014.02	023.64	024.32
Gross Trfr 1 Mvarh (Main Exp)	023.96	020.18	019.96	009.68	017.28	016.16
Gross Trfr 1 MWh (Check Exp)	032.00	026.02	029.38	014.02	023.64	024.34
Gross Trfr 1 Mvarh (Check Exp)	023.96	020.18	019.96	000.00	000.00	000.00
UNIT TRANSFORMER 2	Unit 1 Trfr 2	Unit 2 Trfr 2	Unit 3 Trfr 2	Unit 4 Trfr 2	Unit 5 Trfr 2	Unit 6 Trfr 2
22KV						
Gross Trfr 2 MWh (Main Exp)	023.24	037.30	024.48	037.34	024.40	024.96
Gross Trfr 2 Mvarh (Main Exp)	015.48	024.84	015.46	026.00	016.74	016.38
Gross Trfr 2 MWh (Check Exp)	023.24	037.32	024.48	037.32	024.38	024.98
Gross Trfr 2 Mvarh (Check Exp)	015.48	024.84	015.46	000.00	000.00	000.00
UNIT TO STATION	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
11KV						
Gross Unit to Station MWh Exp	393.00	572.00	001.00	000.00	000.00	000.00
Gross Unit to Station MWh Imp	000.00	000.00	000.00	000.00	000.00	000.00
Gross Unit to Station Mvarh Exp	000.00	000.00	000.00	000.00	000.00	000.00
Gross Nett Auxiliaries MWh	448.26	635.32	054.86	051.36	048.04	049.28
Gross Nett Auxiliaries Mvarh	039.44	045.02	035.42	035.68	034.02	032.54

6 Technology Options



Technology advances over the past years has now provided energy metering equipment with Ethernet communications. The EMDAS can now be provided at a reduced cost with the same reliability.

Advantages:

- Reduced Cabling: Single Ethernet communication cable replaces multiple pulse signals.
- Reduced Hardware: No high speed pulse capturing modules are required. Dual EMDAS server can be replaced with a single server as data is already duplicated in the field by the main and check meter configuration. Meters also have the built in capability of storing more than 100 days of data arranged into hourly load profile data blocks.

Disadvantages:

The Ethernet network gives rise to a single point of failure. However the risk can be reduced by splitting the main and check networks and using ring network configuration. Real time data capturing is not possible as data uploads from the meters currently takes more than 2 seconds. However by prioritizing data critical station data can be uploaded reduced in reduced time frames.