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		Rev: 01
		June 2012
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	REQUIREMENTS FOR POWER SUPPLY TO INSTRUMENTATION SYSTEMS (PROJECT STANDARDS AND SPECIFICATIONS)	

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1. SCOPE

- 1.1 This Technical Specification covers requirements governing the design of systems and equipment for supplying power to instrumentation and other essential services.

2. DEFINITIONS

- 2.1 Instrument includes the following:

- a. Transmitters, controllers, recorders, indicators
- b. Computers, data loggers, and related equipment
- c. Stream Analyzers
- d. Startup, sequence, shutdown, and emergency trip systems
- e. Actuators
- f. Annunciators, monitors, alarms, telemetry
- g. Drives in purging, pressurizing, and air conditioning systems necessary to instrumentation
- h. Flow diagram projectors

- 2.2 Other essential services, intended to be fed by the instrument power supply, include (but are not limited to) radio or other communication equipment needed during a power outage, motor operated valves for emergency use, and control house (or room) emergency lighting.

- 2.2 Non-classified loads are those which are non-essential during general power outages, and whose loss may be also tolerated during infrequent and repair of their power supply.

- 2.3 Tolerable transfer and outage times are the longest supply interruption which will not have a significant effect on process or equipment operation.

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3. DOCUMENTATION

3.1 One-line diagrams shall cover all equipment up to and including distribution panels, and shall show the following:

- a. All power connections
- b. Metering
- c. Identification of normal and standby equipment and circuits, and means of initiating switching to and from standby.
- d. Transformers connections (delta, wye)
- e. System grounding
- f. Bus ampere ratings
- g. Breaker and fuse ratings

3.2 Equipment ratings provided with the one-line diagram, shall include:

- a. Batteries: Ampere-rating and discharge rate at which it applies, number of cells.
- b. Chargers: Maximum output current at rated voltage, maximum output voltage.
- c. Inverters:
 1. Output voltage, frequency, watts and volt amperes.
 2. Maximum steady state errors, at any load from zero to rated, in the following categories:
 - Percent harmonics
 - Voltage deviation
 - Frequency deviation

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and the range of the following operating conditions for which those maxima hold:

- Load power factor
- Input (d-c) voltage
- Ambient (room) temperature

3. Minimum voltage, and time to recover rated voltage, upon sudden application of rated load.

d. Stabilizers:

- 1. Output voltage, watts, and volt-amperes.
- 2. Maximum steady state errors, at any load from zero to rated, in the following categories:

Percent harmonics (a-c stabilizer) Voltage deviation

and the range of the following operating conditions for which those maxima hold:

- Load power factor (a-c stabilizers)
- Input Voltage
- Input frequency (a-c stabilizers)

3. Minimum voltage and time to recover rated voltage, upon sudden application of rated load.

e. Transfer Switches: Amperes, switching time

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f. Generators:

1. Voltage, number of phases, output proper, power factor.
2. Maximum steady state errors, at any load from zero to rated load/phase, in the following categories:
 - Percent harmonics
 - Voltage deviation
 both for balanced load and for single-phase load only.
3. Minimum and maximum voltage, and time to recover rated voltage, upon sudden application or removal of rated load and of actual load.

3.3 A load list covering each load shall include the following:

- a. Load classification
- b. Voltage, frequency, and harmonic tolerances, if critical.
- c. Inrush kVA
- d. Range of operating power factor

3.4 Operation and maintenance manuals shall be furnished by the vendor responsible for the complete system. Manuals shall be written specifically for the equipment being furnished and shall contain (but not limited to) the following information:

- a. Procedures for the installation, commissioning, operation and shutdown of the system.
- b. Procedures for maintenance and troubleshooting of the system utilizing shop test results as a basis.
- c. Results of shop tests.
- d. Complete Bill of Materials, Parts List and set of final "as-built" drawings.

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3.5 A coordination study shall demonstrate the selectivity of circuit protective devices throughout the system. The study shall consider all protective devices in the system, including those protecting individual loads and subfeeders downstream of the distribution panel in the power supply distribution section. Where system components have a current limiting effects, the study shall include the bases other than timecurrent curves used to establish selectivity. The study shall identify any fault locations, and ranges of fault current, for which fault clearing time exceed the tolerable outage time of any affected instrumentation (as established by the load classification). The effect of battery internal resistance shall be considered in the study.

4. LOAD CLASSIFICATION

4.1 Classification of a-c instrument power loads shall be based on the tolerable time of transfer between normal and standby supplies as follows:

TOLERABLE TRANSFER TIME, seconds	CLASS
0.005 (approx. 1/4 cycle)	1
0.2 (10-12 cycles)	11
over 0.2 – 10 (Note 1)	111
Transfer to Standby Not Required	Not Classified

Note: (1) Upper limit may be as high as 30 seconds if startup of internal combustion engine is involved.

4.2 Classification of d -c instrument power loads shall be by specification of tolerable outage time for each. Particular attention shall be given to devices in shutdown circuits.