

Technical specification for Data Concentrator Unit (DCU)

1. Introduction:

The Objective of the DCU is to collect the energy meter data without any human intervention and send it to the sub station over communication network.

2. Concept:

Data Concentrator Unit (DCU) should be capable of acquiring load survey data and midnight data from multiple meters. DCU should be compatible with different make meters present in a sub-station. Data is used to generate various reports for proper load planning and monitoring required for Energy management. Data collected from meters should be stored in DCU, enabling transmission of the acquired data at pre-configured intervals.

DCU is to be engineered for use in substations and should meet the requirements of input power and robustness for operation in these environments.

3. General specification:

- a) The Concentrator shall interface with connected meters and master control centre using bi-directional communication.
- b) The master control centre should be able to read and configure the concentrator's data and parameter locally as well as remotely.
- c) The concentrator should be able to detect the presence of new meter.
- d) The concentrator should collect its own events/alarms and that of meters which are connected to it.
- e) The concentrator should have the capability to retrieve and retain the required data from/ to the meter at cyclic time interval
- f) The concentrator should be able to restart locally and remotely.
- g) The concentrator should regularly check communication of the meters.
- h) Lifespan of the concentrator should be at least 20 years with maximum failure rate annual of 0.5%.
- i) Buffering of data in the event of loss of communication or power interruption.
- j) Create and optimize the low-voltage power line mesh to ensure reliable communications.

- k) Specially designed secured algorithms to detect and validate various UTILITY defined tamper conditions, supply and service violations, power outages etc.
- l) The time and duration of all Power Outage of any phases is logged.
- m) EMI and EMC compliance to standards.

4. Operational requirement:

- a) Events collected should be made available to master control center either by PUSH or PULL mode.
- b) The events for meters should include meter reading failure, power on/off concentrator, clock deviation of energy meter and etc.
- c) The DCU should gather load survey and midnight data from at least 20 meters and store them locally.
- d) Data to be acquired at every block with interval of every 15 minutes from all meters.
- e) The DCU should have the capability to store data from each meter for up to 45 days.
- f) The Concentrator should maintain time sync with all connected meters w.r.t Control Centre.

5. Communication:

- a) The concentrator should support different communication type.
- b) For communication with outside world, DCU should have option for in-built GPRS /3G/ 4G modem for wireless network Connectivity. In KPTCL substations Where VSAT connectivity is available can be utilized. In cases where the sub-station is not having VSAT connectivity, GPRS / 3G/4G connectivity is required to send the data.
- c) For the wireless (GPRS / 3G/4G) DCU, the DCU shall have visual indications
(LEDs) for:
 - I. Network status
 - II. GPRS Connectivity
 - III. Signal strength (4 LEDs)
- d) The concentrator system should support IPv4 and upgradeable to IPv6

6. Security:

- a) Concentrator should encrypt data collected by different meters at collection end and decrypt the data received at Control Centre.
- b) At least AES128 method should be used in all information exchanges in private network & in LAN.
- c) At least ECC192 method should be used in all information exchanges in public network, between concentrator and central system directly.

7. Control Centre Software Specifications:

- a) Centralized Software at the Control Centre which communicates with all DCUs and downloads all meter data.
- b) For scalability purpose in future remote maintenance using web server technology is required.
- c) DCUs present on the VSAT network are identifiable by unique IP.
- d) The software shall have the capability to schedule data retrieval from each of the DCUs either based on fixed time or based on time intervals (e.g. every 6 or 8 hours). Multiple DCUs can be scheduled at the same-time.
- e) A new DCU is connected into the network, then all the previous days data should be retrieved for all meters connected to the DCU.
- f) **On-Demand Basis:** The software should provide the capability to retrieve data from one or more DCU i.e. should support the demand for specific data retrieval as demanded by the Control Centre end. Suitable User Interface and DCU back-end firmware is required to facilitate this.
- g) Dashboard showing the connectivity status all DCUs is required. User should be alerted with all DCUs for 'Non-communicating' DCUs. 'Non-communicating' DCUs are those DCUs for which connection for data retrieval could not be established.
- h) Format of data acquired from DCU should be in presentable format, preferable *.csv format as per KPTCL data format. Also option should be made for transferring the data to databases. (Oracle, MySQL, etc.).
- i) While downloading the data from the meter, current progress and status of the process should be available to the user.
- j) The software of the concentrator should optimize the volume of data exchanged in LAN & WAN.

8. Hardware Specifications:

- a) The DCU should have provision for 2 serial ports and two Ethernet port.
- b) The DCU should operate from 110V - 250VDC. The DCU should be DIN Rail mountable.
- c) The serial ports should be software configurable for RS232 or RS485 mode
- d) The serial port should provide +5V DC supply for the meter communication
- e) The power supply should support at least 4 to 5 Meters for each port
- f) The serial port when configured as RS232 should support one meter per port and when configured for RS485 port it should support 4 to 5 meters
- g) All serial port line should have 15KV ESD protection and surge protection.
- h) The serial ports should be isolated port from power supply and other serial ports(triple Isolation)
- i) The isolation voltage should be minimum of 2KV
- j) The baud rate of serial port should be programmable from 50bps to 38400bps.
- k) Status indication for each serial port.
- l) The Ethernet port should support 10/100Mbps.
- m) The Ethernet port should support Auto MDI/MDIX.
- n) The Ethernet port should have link and speed indication.

9. Operating Temperature:

- a) Specified Operating Ranges from -25 to 60°C.
- b) Range for storage : 0 to 85°C
- c) Range for transport without any failure : 0 to 85°C
- d) Ambient Relative Humidity: 5 to 95% (non-condensing)

10. Power Requirements:

- a) Input Voltage: 90 to 270 V Universal(AC and DC)
- b) Power Connector: Terminal block

11. DCU should meet the following EMI/EMC, Environmental and Safety Standards

- a) CISPR 11, 1990 - Radio Frequency Interference - Radiated Emission Test
- b) CISPR 11, 1990 - Radio Frequency Interference - Conducted Emission Test
- c) EN 61000-4-2 - Electrostatic Discharge Immunity Test - Level 3,
- d) EN 61000-4-3 - Radio Frequency Interference - Immunity Test Level 3,
- e) EN 61000-4-4 - Electrical Fast Transient Immunity Test - Level 4,
- f) EN 61000-4-5 - Surge Immunity Test - Level 3,
- g) EN 61000-4-6 - Conducted Susceptibility (Immunity) Test - Level 3,
- h) EN 61000-4-8 - Magnetic Field Immunity Test - Level 1,
- i) IEC 60068-2-27 Shock Test
- j) IEC 60068-2-6 Sinusoidal Vibration Test
- k) IEC 60028-2-1 - Temperature effect test - Cold Test - Ad
- l) IEC 60028-2-2 - Temperature effect test - Dry heat Test - Bd
- m) IEC 60028-2-3 - Relative Humidity Test
- n) IEC 60028-2-14 - Change of Temperature Test
- o) EN 61010-1 Dielectric Test
- p) EN 61010-1 INSULATION RESISTANCE TEST