EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 20-501-2
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TECHNICAL SPECIFICATION

FOR

DATA CONCENTRATOR

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Data Concentrator

1. Data Concentrator - General Specifications:

The Data Concentrator shall serve as the interface between the Head End System (HES) and the meters connected to the Data Concentrator.

1.1. The Data Concentrator shall support at least 1000 meters.
1.2. The Data Concentrator shall function and communicate with the installed meters .when placed/fixed away from the nearest electronic smart meter by a minimum distance of 500 meters.
1.3. The Data Concentrator shall interface with connected meters using bidirectional communication.
1.4. The Data Concentrator shall interface with the HES system using bidirectional communication.
1.5. The Data Concentrator shall have a mechanism to retrieve the required data from/to the meter at cyclic time intervals.
1.6. The Data Concentrator shall have the capability to retain the required data from/to the meter at cyclic time intervals.
1.7. The Data Concentrator meter reading cycle shall be programmable by HES.
1.8. The Data Concentrator shall be able to receive requests from the HES.
1.9. The Data Concentrator shall be able to send responses as requested to the HES.
1.10. The Data Concentrator shall be accessible by the HES for remote reading and configuration of the Data Concentrator's data and parameters.
1.11. If communication between the Data Concentrator and HES has failed, reestablishment of communication shall be attempted, during which the Data Concentrator shall store all of the scheduled meter reading records. The storage media (nonvolatile memory or any other storage devices) shall be sized to retain three months' worth of data for all the meters managed by the Data Concentrator.
1.12. The Data Concentrator shall determine the interval and periodicity of command sending to HES through combining requests and optimizing communication.
1.13. The Data Concentrator shall be able to send commands to the meters and to take delivery of the answers (the Data Concentrator shall accept acknowledgement messages). Acknowledgement messages are not required for commands broadcasted by the Data Concentrator.
1.14. The Data Concentrator shall detect the presence of newly-installed meters in Data Concentrator's network.
1.14.1. The Data Concentrator shall register a newly installed meter in Data Concentrator's network map automatically.

1.14.2. The Data Concentrator shall automatically synchronize the newly installed meter real time clock (RTC) with the Data Concentrator's internal RTC.

1.15. The RTC Synchronization process shall be done in a (local and remote) programmable periodic time for both:

a) HES and Data Concentrators.
b) Data Concentrator and its connected meters.

1.16. The Data Concentrator shall regularly check communication of the meters to assess the health of the network communications.

1.17. The Data Concentrator shall record the meter connectivity health in the storage media.

1.18. The Data Concentrator shall collect its own events/alarms as well as those from meters that are connected to it. Two modes (configurable locally and remotely) of communicating these events/alarms with the HES shall be supported:

1.18.1. Push: the events are sent by the Data Concentrator to the HES.

1.18.2. Pull: the events are requested by HES.

1.19. The events for Data Concentrator shall include:

1.19.1. Parameters initialization
1.19.2. Parameters loss
1.19.3. Parameters update
1.19.4. Forced OS (operating system) Restart events
1.19.5. Automatic OS Restart events
1.19.6. Media Storage Failure (minimally data corruption, overlapping, permanent failure).
1.19.7. Internal backup power source failure (battery, and any auxiliary power source)
1.19.8. Any tamper/fraud/violation events (opening of the Data Concentrator case cover, connection terminal cover)
1.19.9. Meters parameters update
1.19.10. Meter reading failure

1.20. The events collected from the meters by the Data Concentrator shall include

1.20.1 Standard meter events

1.20.1.1	Power on/off (connected/restoration, disconnected/loss)
1.20.1.2	Meter clock outdated
1.20.1.3	Meter backup battery failure
1.20.1.4	Meter internal failure

1.20.2 Tamper events

1.20.2.1	Meter cover open
1.20.2.2	Meter terminal cover open
1.20.2.3	Current reverse
1.20.2.4	Bypass current connection
1.20.2.5	Fully earth current connection
1.20.2.6	Partially earth current connection
1.20.2.7	Missing phase voltage

1.20.2.8 DC/AC magnetic field presence
1.20.2.9 Any other defined tamper events from the connected meters

1.20.3 Relay operation events (connect, disconnect, failure to operate)
1.20.4 Power quality events
1.20.5 Voltage outage events
1.20.6 Communication failure events

1.21. The Data Concentrator shall classify and record events as important or normal events according to events classification procedures that should be programmable either remotely or locally.
1.22. The Data Concentrator shall push a warning message to the HES for the highest priority events occurrence.
1.23. The Data Concentrator shall be able to identify the feeding phase of each meter (for single-phase meters).
1.24. The Data Concentrator shall be able to detect changing of feeding phase of meter (for single-phase meters).
1.25. The Data Concentrator shall be able to restart its operating system via local command for maintenance procedures.
1.26. The Data Concentrator shall be able to restart its operating system via remote command for maintenance procedures.
1.27. The Data Concentrator shall be able to restart its operating system “automatically in case of any processing failure in its operating system, with a record of that event retained in the Data Concentrator media storage. The Data Concentrator shall specify the scenarios in which such a restarting is occurred, and whether they were automatic or forced.
1.28. The lifespan of the Data Concentrator shall be 20 years.
1.29. The accuracy of Data Concentrator RTC should be 0.5 second per day in 23°C degree, and 0.15 second change against 1ºC change per day. The Data Concentrator shall contain the Gregorian calendar including Leap year.
1.30. The Data Concentrator shall have Daylight Saving Time (DST) mode.
1.31. The Data Concentrator shall permit local and remote Daylight Saving Time (DST).mode switching.
1.32. The Data Concentrator shall permit local and remote date and time setting.
1.33. The Data Concentrator shall be certified with the Insulation Protection Class 2.

2. Data Concentrator - Power Supply Requirement:

2.1. The Data Concentrator shall work with both single-phase and three-phase alternating current power supply with 50Hz, 220 V between phase and neutral.
- 2.1.1. The normal working voltage range shall be ±30% of nominal voltage
- 2.1.2. The normal working frequency range shall be ± 5% of nominal frequency

2.2. The Data Concentrator power consumption shall be stated by the Bidder but in case shall exceed the following:
- 2.2.1. The Data Concentrator is not communicating (shall be less 5W and 10VA).
- 2.2.2. The Data Concentrator is communicating (shall be less 10W, 15VA).

2.3. The Data Concentrator shall be insensitive to grid voltage fluctuation, shorter than or equal to 500ms time duration.

2.4. The Data Concentrator shall be equipped with two different backup power sources.
- 2.4.1. Non-rechargeable battery for keeping the internal Data Concentrator RTC (Real Time Clock) functional during grid network power failure
- 2.4.2. Rechargeable battery for keeping the communication between the Data Concentrator and HES working during grid network power failure , in order to supply the Data Concentrator with the proper power for sending a notification message to HES with that event, along with the last updated meter reading records.
- 2.4.3. Both batteries shall be capable of being replaced without opening the Data Concentrator case.

2.5. The RTC battery shall function for 10 years under normal operating conditions.

2.6. The RTC battery shall be field upgradeable.

3. Data Concentrator - Mechanical Requirements:

3.1. The Data Concentrator case material shall be polycarbonate and it should be fire, heat, and ultra violet radiation resistant.

3.2. All parts of the Data Concentrator shall be resistant to mechanical shock and shake during transportation.

3.3. Data Concentrators installed indoors shall have an enclosure protection of at least.IP51.

3.4. Data Concentrators installed outdoors shall have an enclosure protection of at least IP54.

3.5. The Data Concentrator shall have four (4) connecting terminals to be powered from the grid network. The connecting terminals to the power supply shall be made by unlovable screws.

3.6. The Data Concentrator shall have the minimum markings:
- 3.6.1. Data Concentrator Serial number.
- 3.6.2. Manufacture/Vendor Name.

3.6.3. Utility Name.
3.6.4. Operating Voltage in V.
3.6.5. Supply voltage variation.
3.6.6. Operating Frequency in Hz.
3.6.7. Frequency Variation.
3.6.8. Symbol of the class of protection II.
3.6.9. Conformity Standards.
3.6.10. Operating temperature range.
3.6.11. Year of Manufacture.
3.6.12. 3 phases and neutral letter marking.
3.6.13. Data Concentrator's wiring connection.
3.6.14. Communication Port identification letters marking.

3.7. There shall be a protective cover, used for maintenance and other operations by Supplier or Agency personnel, rendering inaccessible under normal operating conditions the two backup power sources, plug and play communication (FAN and WAN) modems and the local communication ports (RS485, RS232, and RJ45 Ethernet except Optical port).

3.8. The protective cover of 3.7 shall be equipped with a sensitive switch to indicate the cover/door opening/closing, in order to record that event into the Data Concentrator's media storage.

3.9. The sensitive switch for the protective cover shall trigger an event to be stored into the Data Concentrator's media storage.

4. Data Concentrator - Communication Interface:

4.1. The Data Concentrator shall have Plug and Play Communication interfaces, and there shall not be a need to change or modify the concentrator operating system / firmware to any of them:

4.1.1. Data Concentrator Communication with the HES (WAN Modem):
4.1.1.1. Ethernet Interface for connection to WAN router over IP connection.
4.1.1.2. Fixed (not plug and play modem/port) along with backup port interface for connection of an external WAN modem.
4.1.2. Data Concentrator Communication with the connected Meters (FAN Modem):
4.1.2.1. Remote Communication medium:
4.1.2.1.1. PLC or PLC/RF Technology
4.1.2.1.2. mobile wireless service 2G/3G / 4G Technology
4.1.2.1.3. Radio Frequency (RF) Technology (e.g., mesh, point-to-multipoint, etc.)
4.1.2.2. Local Communication medium:
4.1.2.2.1. Fixed (not plug and play modem/port) RS485. This port shall be two wire, active and screw terminal type and shall be easily installed. The wires shall not be contacted

directly to this port by screw. The Data Concentrator shall be capable of reading networked connected meters via RS-485 port.

4.1.3. Data Concentrator Local Communication for configuration and maintenance actions shall be possible by:

4.1.3.1. Optical Port Communication

4.1.3.2. Isolated/Secured Serial RS232 Communication Port

4.2. Data Concentrator's modems shall be isolated electrically from the other parts of the Data Concentrator's circuits.

4.3. Mandatory - The Data concentrator shall communicate with the connected meters with an international open standard communication protocol, via the DLMS/COSEM Application Layer (protocol that provides the interface for the processes required by the use case) an open international protocol to preserve the interoperability and interchangeability between different meter vendors. Alternative open international standard solutions for the communication protocol shall be considered on merit.

4.3.1. The DLMS/COSEM profile(s) will be defined, programmed, and tested during the proof-of-concept and pilot deployments. These definitions, programming, and testing shall be at no additional cost to the Utility.

4.3.2. Remote Communication Connected meters:

4.3.2.1. PLC or PLC/RF Technology

4.3.2.2. mobile wireless service 2G/3G / 4G Technology

4.3.2.3. RF Technology

4.3.3. Local Communication Connected Meters:

4.3.3.1. RS-485 networked international communication Protocol

4.4. Mandatory - The Data Concentrator shall communicate with the HES using the DLMS/COSEM Application Layer international protocol to preserve the interoperability mechanism order between different Head End Systems. Alternative open international standard solutions for the communication protocol shall be considered on merit.

4.4.1. The DLMS/COSEM profile(s) will be defined, programmed, and tested during the proof-of-concept and pilot deployments. These definitions, programming, and testing shall be at no additional cost to the Utility.

4.5. In case of using PLC Technology FAN Modem, the Data Concentrator shall inject the communication signal in the all three phases of the low voltage network in order to enable the Data Concentrator to classify the connected meters per each phase.

4.6. Parameters of connection to WAN shall be programmable in the Data Concentrator remotely.

4.7. Parameters of connection to WAN shall be programmable in the Data Concentrator locally.

4.8. Parameters of connection to WAN shall be configurable in the Data Concentrator remotely.

4.9. Parameters of connection to WAN shall be configurable in the Data Concentrator locally.

4.10. The Data Concentrator WAN modem shall support static IP addressing.

4.11. The Data Concentrator WAN modem shall support dynamic IP addressing.

4.12. The Data Concentrator Firmware shall be upgradable and allow the later addition of other technologies.

4.13. The Bidder shall give the detailed specifications of the protocol between the data concentrator and HES.

4.14. For each communication technology, the Bidder shall specify the mechanism of establishment of the connection and volume of data exchanged (negotiation of establishment, strategy of reconnection in the event of failure, authentication, sending of parameters IP).

4.15. For each telecommunication technology, the Bidder shall describe the sequence of connection process after installation of the concentrator, and in particular:

4.15.1. How it is started

4.15.2. The volume of exchanged data

4.15.3. Its minimal, average and maximum duration

4.15.4. How it is stopped

4.16. A detailed description of WAN communication layers as designed for this deployment shall be provided by the Bidder.

4.17. For scalability, and to render the tasks of remote maintenance more convenient, web server technology is required. The software in the Data Concentrator should be the web server.

5. Data Concentrator - Operating System :

5.1. Applicative software for all the Data Concentrators shall be provided. This software .shall be compatible with different Data Concentrator's vendors.

5.2. The Data Concentrator operating system shall be upgradable over its operating lifetime without a hardware change (e.g., extra memory installed).

5.2.1. The Data Concentrator operating system shall be upgradeable via local communication means.

5.2.2. The Data Concentrator operating system shall be upgradeable via remote communication means.

5.3. The Data Concentrator shall apply priorities in the execution of its tasks.

5.3.1. An urgent task (for example, those that take part in the service of operation of meter's supply contactor) shall be carried out in high priority.

5.4. If a level of service would be likely not be maintained, the software of the Data Concentrator shall be able to suspend the execution of a low priority task to treat the urgent tasks.

5.4.1. The suspended tasks shall be automatically executed again following the completion of the urgent tasks.

5.5. The Data Concentrator shall optimize the volume of the data exchanged on FAN with arbitrary collections of meters, for example, by transmitting one message using broadcast or multicast mechanisms when several identical commands must be sent to a certain number of meters of the collection.

5.5.1. The mechanism(s) by which this is achieved shall be explained in detail by the Bidder.

5.6. The Data Concentrator shall optimize the volume of data exchanged on the WAN with HES by gathering in only one message for simultaneous transfer all the data from the meters of the same bunch.

5.6.1. The mechanism(s) by which this is achieved shall be explained in detail by the Bidder.

6. Data Concentrator - Security Requirements:

6.1. The Data Concentrator shall use a method for encryption/decryption of data exchanged via all interfaces.

6.1.1. At least AES128-CBC/GCM *method shall be used in all information exchanges in private network, between meter and Data Concentrator (FAN interface), and local interfaces , Enough reserve capacity in the components of the system (e.g., main processor, memory) shall exist to support AES256-CBC/GCM during the service life of the equipment.*

6.1.2. The DCU should be capable of supporting AES256-CBC/GCM during its operational lifetime without a hardware change.

6.1.3. *At least* ECC 256 *method shall be used in all information exchanges in public network as well as between Data Concentrator and HES.*

6.2. The security methods and equipment shall be described in details by the Bidder

6.3. The Bidder shall demonstrate to the satisfaction of the Agency the following items:

6.3.1. *Security of method*

6.3.2. Utility's operator ability to change security key remotely

6.3.3. Confidentiality of remote key changing

6.3.4. *All input and output information decrypted and encrypted*