1. Scope

This document outlines metering solutions specifications and practices in regards to utility revenue metering, tenancy metering, base building and sub-metering for measuring electricity, water and gas consumption.

2. Metering Scenarios

2.1. **Utility Revenue Metering** involves the measurement of the main incoming points from the local or selected supplier.

2.1.1. Electricity metering requires pulse outputs to be provided to capture WH and VARH measured by the utility electricity meter(s). The metering assets are usually the responsibility of the Network owner or Meter Provider and negotiation is required with this entity to provide access to the pulse outputs (KWH & KVARH).

2.1.2. Water metering requires a pulse output to be provided to capture the consumption (KL) as measured by the utility water meter(s). The metering assets are usually the responsibility of the network owner and negotiation is required with this entity to provide access to metering with pulse capability.

2.1.3. Gas metering requires a pulse output to be provided to capture the gas usage (m^3) as measured by the utility gas meter(s). The metering assets are usually the responsibility of the Network owner and negotiation is required with this entity to provide access to the pulse.

Utility revenue metering may involve one of the following when the main incoming meter is provided by another entity:-

2.1.4. Parallel metering requires the installation of a meter in parallel with the customer's main incoming/revenue meter. This helps to confirm accuracy of the main meter and/or provides measurement/communication options that the main meter lacks.

2.1.5. The local supplier/retailer/meter provider or meter data provider provides one or more of the following to allow measurement of the incoming meter.

- Provision of a data stream
- High level connectivity e.g. MODBUS
- Low level connectivity e.g. Pulsing outputs

2.2. **Sub-metering** involves measurement of the strategic points beyond the main incoming meters, in the utility and energy supply lines.

2.2.1. Electricity sub-metering requires reading of electricity meters to gather data (KWH, KVA, KVARH and power quality) for reporting and meeting compliance programs

2.2.2. Water sub-metering requires reading of data loggers attached to water meters to measure water consumption (KL)

2.2.3. Gas sub-metering requires reading of data loggers attached to gas meters to measure gas consumption (m^3)

2.3. **Tenancy Metering** involves measurement of energy usage in the space occupied by tenants in a building where the building owner may be sub-leasing the tenancy. Tenancy metering is also referred to as embedded network.

2.3.1. Electricity tenancy metering requires reading of electricity meters to gather data (KWH) for the purpose of cost allocation and revenue collection

2.3.2. Water tenancy metering requires reading of data loggers attached to water meters to measure water consumption (KL)

2.4. **Base Building Metering** involves measurement of energy usage in the non-tenanted parts of the building.

2.4.1. Electricity metering requires reading of electricity meters to gather data (KWH) for the purpose of revenue collection and reporting performance etc.

2.4.2. Water metering requires reading of data loggers attached to water meters to measure water consumption (KL)

3. Solutions to the Metering Scenarios

3.1. **Non-remote Read** involves face reading meters where data is manually entered into a spreadsheet for billing. Pre-programmed electricity meters only shall be supplied according to the needs identified at the initiation of a project.

3.2. **Non-remote Read with Local Head-end BMS Connectivity** involves face reading meters and data entered into a spreadsheet for billing. The electricity metering system is also networked so meter data can be read and processed onsite by a central Building Management System (BMS), typically in real-time and is used for controlling the energy network. The BMS is usually the responsibility of the Building Developer and negotiation is required with this entity to interface with the BMS system. One or more of the following shall be supplied according to the needs identified at the initiation of a project.

- Pre-programmed electricity meters
- MODBUS interface devices to network electricity meters and the BMS system to provide a MODBUS feed

3.3. **Remote Read** involves a remote reading system where data is read remotely, typically each day, stored and validated offsite and supplied to numerous systems for processing for billing or reporting. This is done via mobile phone network or IP communications. One or more of the following shall be supplied according to the needs identified at the initiation of a project.

- Pre-programmed electricity meters
- Data loggers for water meters
- Data loggers for gas meters
- Modems

3.4. **Remote Read with Local Head-end BMS Connectivity** involves a remote reading system where data is read remotely via phone network or IP communications, each day. The data is stored and validated offsite and supplied to numerous systems for processing for billing or reporting. This solution also involves networking with a local Building Management System (BMS), so meter data can be read and processed onsite typically in real-time and is used for controlling the energy network. The BMS is usually the responsibility of the Building Developer and negotiation is required with this entity to interface with the BMS system. One or more of the following shall be supplied according to the needs identified at the initiation of a project.

- Pre-programmed electricity meters
- Data loggers for water meters
- Data loggers for gas meters
- MODBUS interface devices to network electricity meters, a modem and the BMS system to provide MODBUS feed
- Pulse splitters to provide a feed to a data logger and another feed of pulses to the BMS system
- Modems

Pre-programmed electricity meters, data loggers to connect to water meters, data loggers to connect to gas meters, MODBUS interface devices, pulse splitters and modems are available from Metering Dynamics; Call 1300 792 611, Email sales@meteringdynamics.com.au, Visit www.meteringdynamics.com.au

4. Meter Specifications – Electricity metering

Electricity meters shall be supplied according to a single line diagram provided at the initiation of a project. All meters provided shall be National Measurements Institute pattern approved with valid pattern approval certificate/s.

All electricity meters are to be supplied, installed and commissioned in accordance with:

- National Measurements Institute “Pattern Approved” referencing AS1284.5 for Class 1.0 and AS1284.9 for Class 0.5
- National Electricity Rules (NER)
- The relevant State Electricity Act & Regulations
- Jurisdictional Rules and
- AS3000 Wiring Rules

The whole current electricity meters to be used for single phase applications shall have Class 1 (or better) accuracy.

The whole current or CT electricity meters to be used for three phase low voltage applications shall have Class 1 (or better) accuracy.

The CT electricity meters to be used for three phase high voltage applications shall have Class 0.5 (or better) accuracy.

All electricity meters shall be equipped with one RS232 serial communication port for modem connection. Meters shall measure billing log - import WH, VARH and export WH, VARH. Meters shall measure power quality on request. Meter shall hold at least 10 years of 4 channel 30 minute interval data in memory.

Current transformers for KWH metering shall:

- Comply with NER standards
- Comply with AS 1675 / AS 60044
- Meet equivalent of class 0.5 for revenue metering and Class 1.0 (or better) for all other metering
- Have secondary shorting links or an earthed secondary winding
- Be of the resin encapsulated type
- Have 5A secondary windings
- Be separate units for metering and protection
- Be suitable to withstand the maximum fault current as specified herein
- Be clearly labelled to identify their rating and use
- Be capable of operating the load of the related device with an additional capacity of 5%

Pre-programmed electricity meters and CTs are available from Metering Dynamics; Call 1300 792 611, Email sales@meteringdynamics.com.au, Visit www.meteringdynamics.com.au

5. Data Logger Specifications – Water metering

A data logger for water metering shall accept pulse outputs from pulse capable water meters. The data logger can be mains powered or battery powered. The battery shall have a minimum four year life. The data loggers shall log water consumption in KL.

All water meters to be installed with a data logger shall be National Measurements Institute “Pattern Approved”. Class 1 accuracy shall apply to all water meters with permanent flow rate of at least 100 m^3/h or KL/h. Class 2 accuracy shall apply to all water meters with permanent flow rate of less than 100 m^3/h or KL/h and may be applied to water meters with flow rate of at least 100 m^3/h or KL/h.

The water meters shall meet applicable utility regulations and be pulse capable with pulse characteristics as defined below for the appropriate type of data logger.

The mains powered data logger shall

- Have Pulse characteristics: Min. 16ms pulse duration at max frequency of 32Hz.
- Collect 30 min interval and consumption data
- Accept up to 12 pulse inputs
- The Master and Slave data logger shall both have battery back up
- The voltage supplied to meter output: 5V at 800µA. Meter output requirements: voltage free contacts / open collector / open drain. Max resistance of 200 Ohms
- Have Krone or Screw connectors
- Up to 35 days of interval data held in memory

The battery powered data logger shall

- Have Pulse characteristics: Min. 125ms pulse duration at max frequency of 4Hz.
- Collect 30 min interval data
- Accept up to 4 pulse inputs
- The voltage supplied to meter output: 5V at 800µA. Meter output requirements: voltage free contacts / open collector / open drain. Max resistance of 200 Ohms

- Have Screw connectors
- Up to 35 days of interval data held in memory

Mains powered and battery powered data loggers are available from Metering Dynamics; Call 1300 792 611, Email sales@meteringdynamics.com.au, Visit www.meteringdynamics.com.au

6. Data Logger Specifications – Gas metering

A data logger for gas metering shall accept pulse outputs from pulse capable gas meters. The data logger can be mains powered or battery powered. The battery shall have a minimum four year life. The data loggers shall log gas consumption in m^3.

There are two types of Gas meters in Australia – Metric meters and Imperial meters. All gas meters to be installed with a data logger shall meet applicable gas utility regulations. They shall be pulse capable with pulse characteristics as defined below for the appropriate type of data logger.

The mains powered data logger shall

- Have Pulse characteristics: Min. 16ms pulse duration at max frequency of 32Hz.
- Collect 30 min interval and consumption data
- Accept up to 12 pulse inputs
- The Master and Slave data logger shall both have battery back up
- The voltage supplied to meter output: 5V at 800µA. Meter output requirements: voltage free contacts / open collector / open drain. Max resistance of 200 Ohms
- Have Krone or Screw connectors
- Up to 35 days of interval data held in memory
- Require suitable isolation unit for connecting to gas meters (e.g. MTL5513)

The battery powered data logger shall

- Have Pulse characteristics: Min. 125ms pulse duration at max frequency of 4Hz.
- Collect 30 min interval data
- Accept up to 4 pulse inputs
- The voltage supplied to meter output: 5V at 800µA. Meter output requirements: voltage free contacts / open collector / open drain. Max resistance of 200 Ohms
- Have Screw connectors
- Up to 35 days of interval data held in memory
- Require suitable isolation unit for connecting to gas meters through a battery powered device (e.g. MTL7715+)

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7. Meter Data Collection Process / Data Management

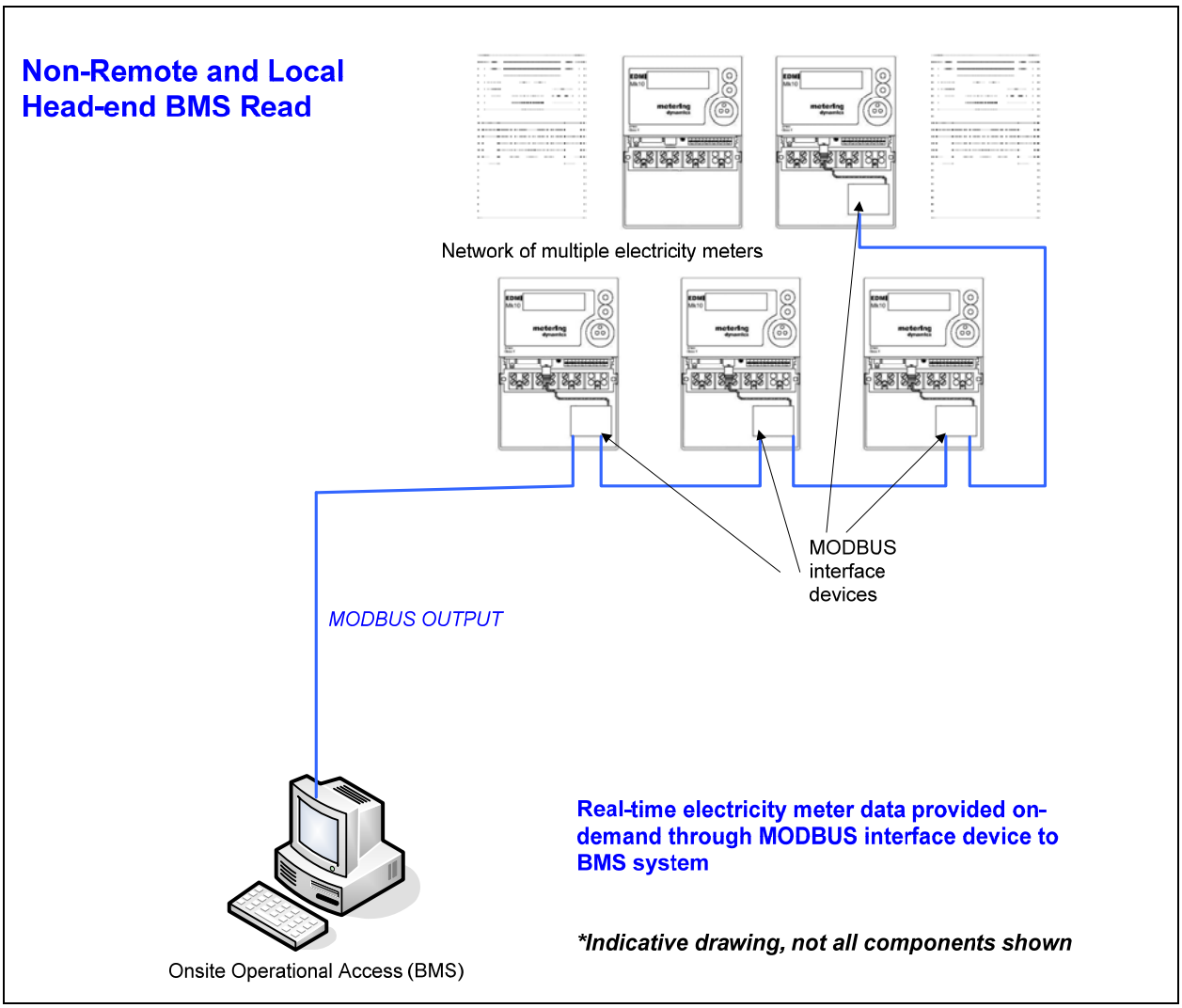
7.1. **Non-remote Read:** The electricity meter shall be face read and data manually entered into a spreadsheet for billing. Pre-programmed meters shall be used according to the needs identified at the initiation of a project.

Once asset is established, the metering data shall be face read.

7.2. **Non-remote and Local Head-end BMS Read:** The electricity meter shall be face read and data manually entered into a spreadsheet for billing. Pre-programmed meters shall be used according to the needs identified at the initiation of a project.

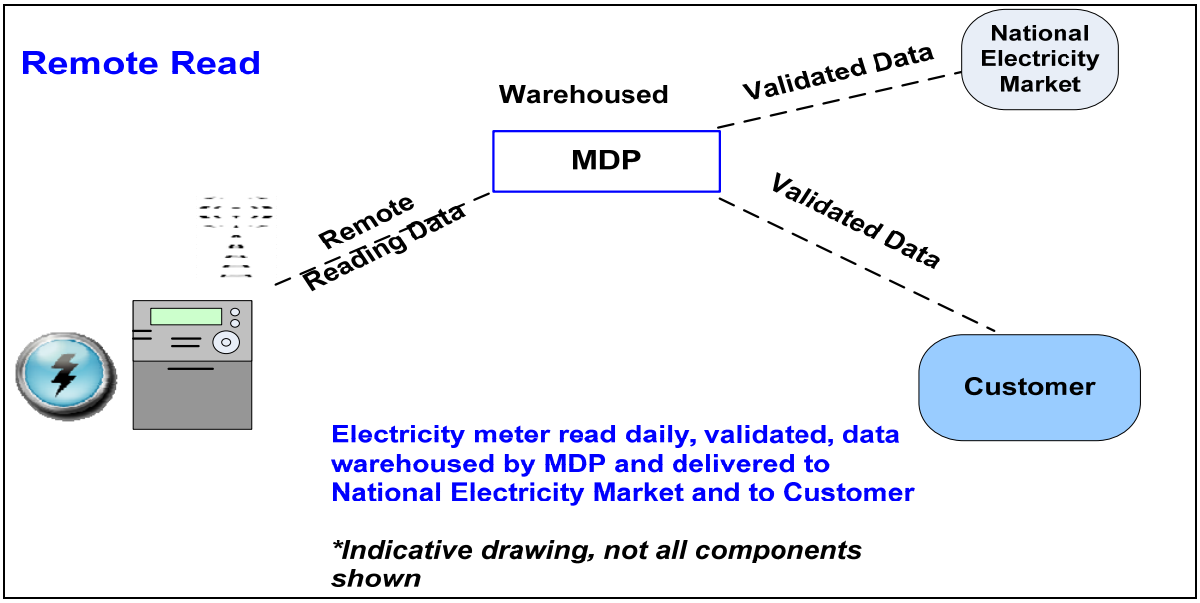
Once asset is established, the electricity meters shall be face read and also be read real-time by a BMS system through MODBUS interface devices. The diagram below shows electricity meters which are connected together in

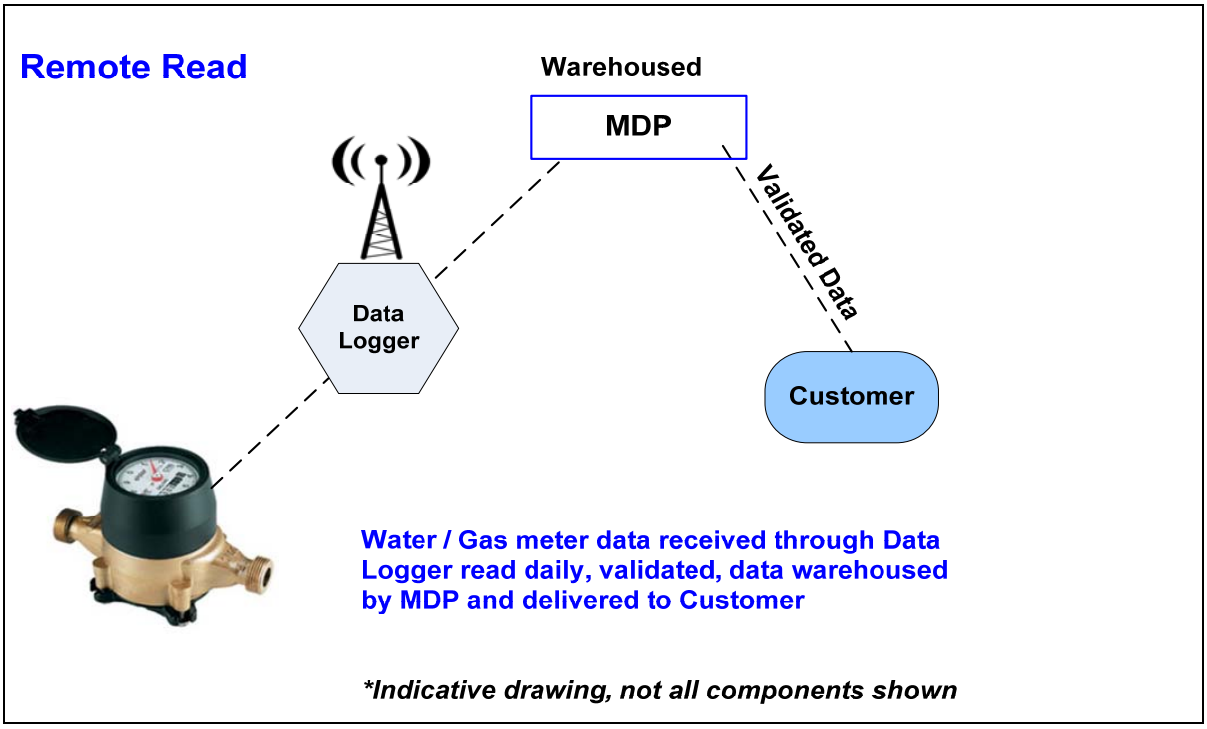
a network through MODBUS interface devices. The MODBUS interface device provides a MODBUS feed to an on-site BMS system.



7.3. **Remote Read:** The electricity meters and/or data logger connected to water / gas meters shall be remotely read reducing the need for utility visits by meter readers. Assets equipped with RS232 serial port shall allow connection to modem. The assets shall have on-board capability to hold data in memory to ensure consumption data will be available when there's communication failure.

Once asset is established, the metering and/or data logger data shall be obtained. Meter and/or data logger shall be read daily, validated, data warehoused by an accredited Meter Data Provider (MDP) and delivered to customer's chosen portal. The diagrams below illustrate how assets are remotely read, validated, warehoused by an MDP and delivered to customer



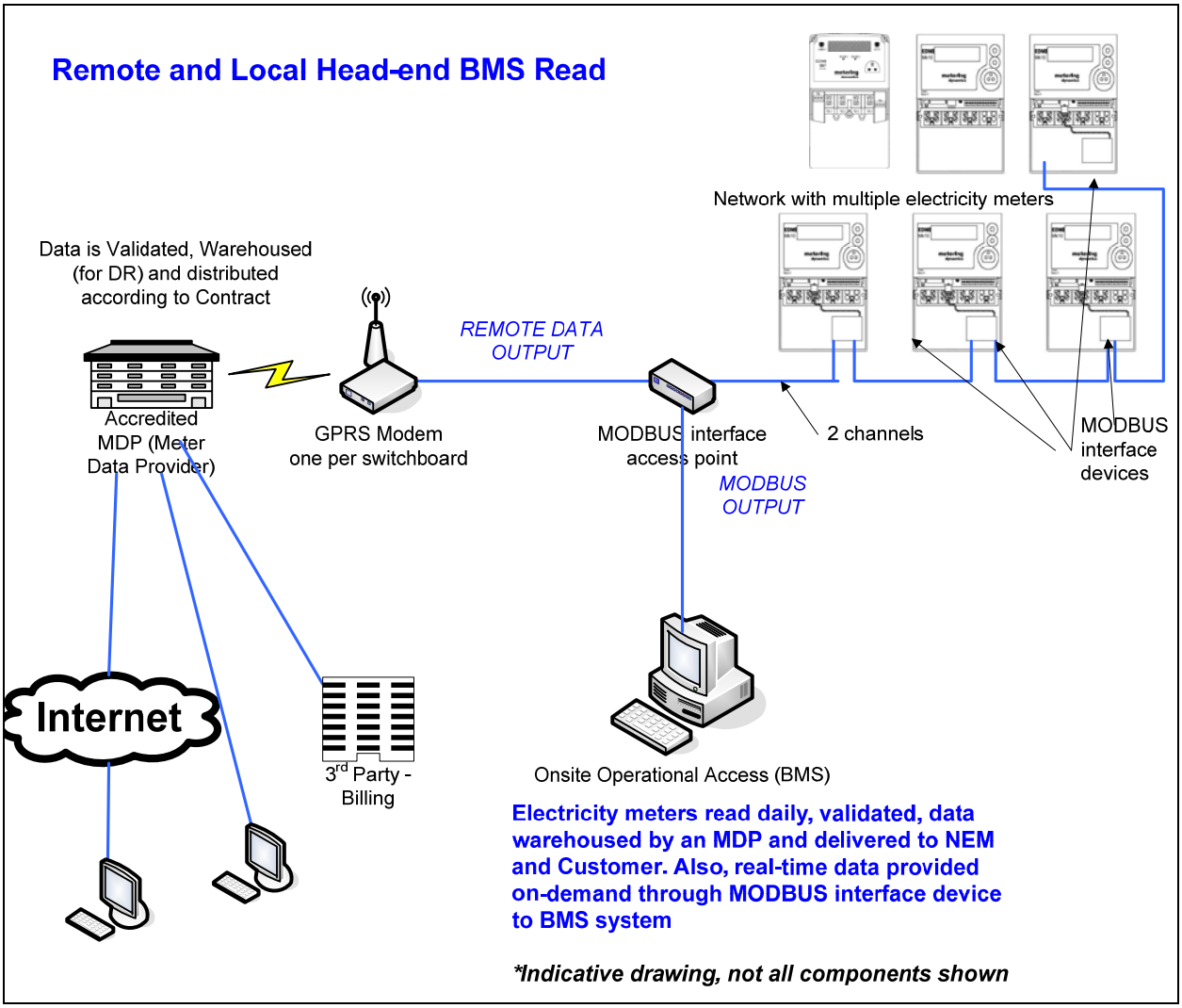


7.4. **Remote and Local Head-end BMS Read:** The electricity meter and/or data logger connected to water / gas meter shall be remotely read reducing the need for utility visits by meter readers. Assets equipped with RS232 serial port shall allow connection to modem. The assets shall have on-board capability to hold data in memory to ensure consumption data will be available when there's communication failure.

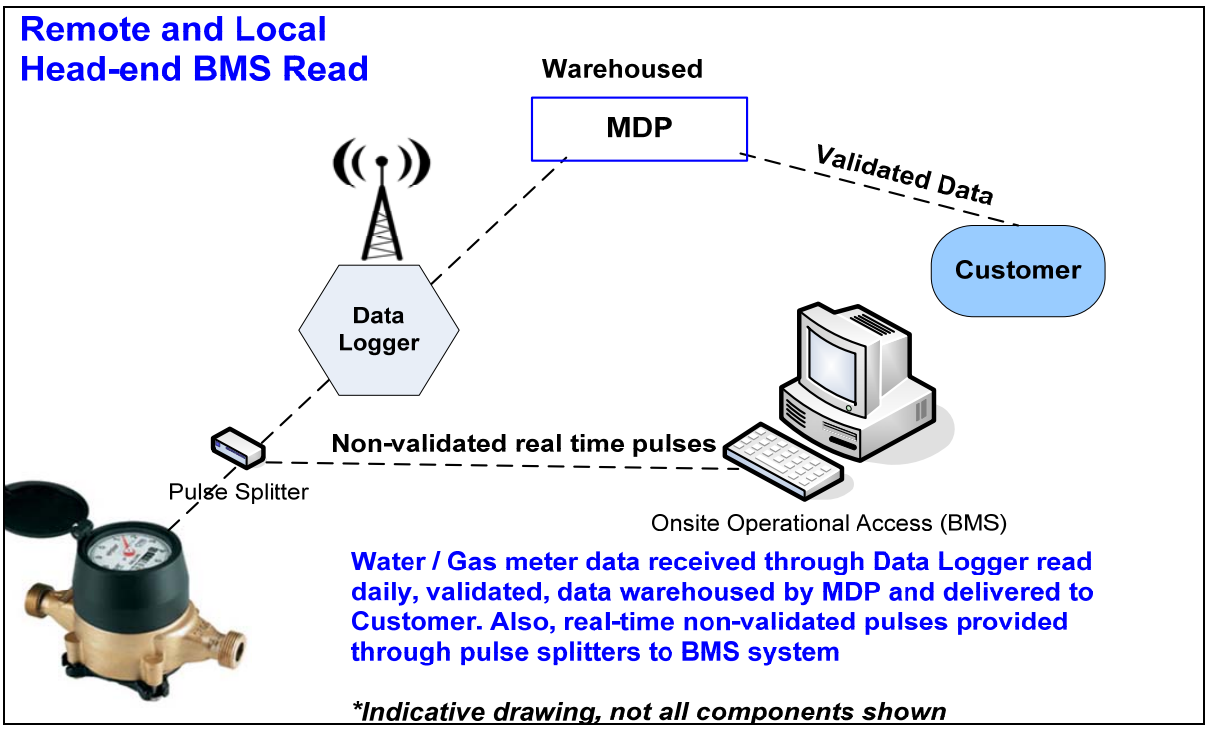
Once asset is established, the metering and/or data logger data shall be obtained. Meter and/or data logger shall be read daily, validated, data warehoused by an accredited Meter Data Provider (MDP) and delivered to customer's chosen portal.

In addition to remotely read through modems, the electricity meters shall be read real-time by BMS system through MODBUS interface devices. The diagram below shows electricity meters which are connected together in a network through MODBUS interface devices. The MODBUS interface device provides two channels of data – one is remote data feed and the other is MODBUS feed. It illustrates how assets are remotely read, validated,

warehoused by an accredited meter data provider (MDP) and delivered to customer for billing/reporting and also provided to a local BMS system.



In addition to remotely read through modems, the water / gas meters shall be read real-time by BMS system through pulse splitters. The diagram below illustrates how assets are remotely read, validated, warehoused by an MDP and delivered to customer for billing/reporting and also provided to a local BMS system.



Electricity meters, data loggers to connect to water / gas meters, MODBUS interface devices, modems, pulse splitters, MDP, customer portal are available from Metering Dynamics; Call 1300 792 611, Email sales@meteringdynamics.com.au, Visit www.meteringdynamics.com.au