Outline Metering Requirements for use with K2n Platform

(Also applicable to iSERVcmb and PSBP)

31st January 2017

This document has been prepared by K2n for guidance on the installation of metering systems suitable for use with the K2n platform. It is intended as a guide only and K2n take no responsibility for omissions or errors.

Users should satisfy themselves that it meets the needs of their specific circumstances and any legal requirements.

CIRCULATION LIST

Public document

AMENDMENT HISTORY

Subject	No.	By	Date
Created	1.0	IPK	10/08/2015
Amended	1.1	IPK/SB/ABK	11/08/2015
Amended	1.2	IPK	14/01/2016
Amended	1.3	IPK	20/06/2016
Amended	1.4	ABK/IPK	31/01/2017

CONTACT DETAILS

K2n Limited
Sheraton House
Castle Park
Cambridge CB3 0AX

E: support@k2nenergy.com

address: K2n Limited Sheraton House
Castle Park Cambridge CB3 0AX UK
email: support@k2nenergy.com

CONTENTS

1. ELECTRICAL DISTRIBUTION AND METERING SYSTEMS

The costs for meters and data collection/aggregation/transmission will depend on the design and layout of the building services and the electrical distribution boards. The advice from K2n would be to ensure the design of the distribution boards minimises the number of meters required to:

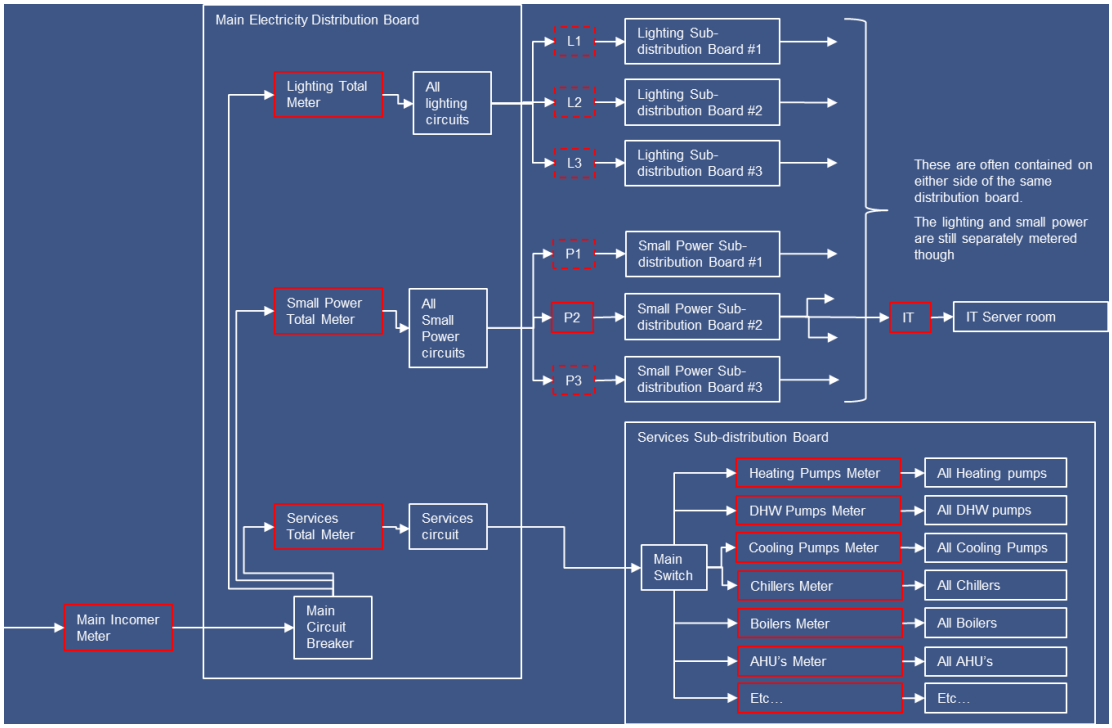
- Ensure separation of the energy use of the electrical services for the occupants (lighting and small power should be separated too), from the building services.
- For multiple sub-distribution boards it is easiest to arrange metering for lighting and small power at each sub-distribution board through clear separation of these end use supplies at each board. This also aids future diagnostic work as the end uses and spaces can be easily identified.
- Separate out centralised IT related consumption (both equipment and services) as well so these can be evaluated completely separately. This applies to Server and LAN rooms particularly.
- High Density IT Suites will often benefit from separated metering of the power and cooling services too, as this will enable a major consumer to be isolated for analysis and to see how much energy is consumed in servicing the space.
- High energy use processes should also be separately metered to enable their consumption to be separated from the small power and building loads.
- New HVAC systems/components can be specified with on-board data collection which you can then send to K2n with the appropriate specification of data transmission capabilities when purchased.
- For the building services, you should separate out there use from small power and lighting use. For diagnostic reasons, where possible you should design the metering to also provide separate sub-hourly consumption data for:
    - Heat generators (Boilers)
    - Cooling generators (Chillers)
    - Space heating/cooling pumps
    - DHW boilers/generators
    - DHW pumps
    - Ventilation supply and extract fans (big load normally when present)
    - Heat rejection units
    - Heat pumps
    - AC Units
    - Humidifiers, Dehumidifiers, Heat recovery units, etc.

Or as requested by the Tender documents or Client.

The picture below shows how the electrical distribution boards design might be influenced by the metering requirements. The dotted meters (L1, L2, etc.) show where additional submeters might be installed should the loads in a certain area be significant. There would be 13+ electricity meters in this schema.

Most of the meters would probably be physically located quite closely to each other and hence have the opportunity to use a joint data collection, aggregation and

transmission system, but meters P2 and IT might require their own data collection, storage and transmission system if they are physically too far away from the other meters. The physical design of the electrical distribution and services systems will therefore have an impact on the metering strategy employed – including the number of meters and data transmission points required.



A K2n spreadsheet is available to show how such a metering approach might look when completed for an example Primary School.

For many buildings, all the services meters and power supplies will be located in the same space (e.g. the boiler house) meaning that a single data aggregator/transmitter can be used for all the services meters in this area.

2. PURPOSE OF METERING

The purpose of any metering is to obtain robust, error free insights into the operation and cumulative consumption of a given end use, component, process, etc.

The minimum requirements for any metering or sensor data collection system used with the K2n platform are:

1. An ability to record and store utility consumption data or sensor data at sub-hourly intervals for a period of at least one day for each meter or sensor point required to be recorded. Suggested recording intervals would be 5, 10, 15 or 30 minutes to enable comparison with other meters on the system.

2. The ability to send this data automatically at pre-set time intervals in text format, with CSV preferred, to an unique email address provided by K2n. This would

normally be daily to enable exception reports to be sent when the data is missing or has errors in it.

3. The data sent should consist of a series of columns with each row representing a time interval. For example, the first row could contain the Unique Meter ID and then, on subsequent rows, column A could be a time and date stamp, column B could contain, ideally, the meter reading or, next best, the consumption in that time interval.

   Other data formats will be available e.g. Unique meter ID repeated in column A every time interval, but the data sent to the system MUST always contain the Unique Meter ID, a date and time stamp per time interval, and a reading or consumption figure per time interval.

   The Unique Meter ID for each meter enables the data to be associated with the correct meter, building and systems. An example of a typical 30 minute interval data stream with meter reading data is:

Unique Meter ID on first line: ABC123	
28/02/2014 19:00	**522331.6**
28/02/2014 19:30	**522336.3**
28/02/2014 20:00	**522340**
28/02/2014 20:30	**522343.3**
28/02/2014 21:00	**522346.6**
28/02/2014 21:30	**522350.1**
28/02/2014 22:00	**522353.3**
28/02/2014 22:30	**522356.5**
28/02/2014 23:00	**522359.8**
28/02/2014 23:30	**522363.1**

   The data format of a meter must stay the same during the data upload. If the format changes K2n should be asked to reconfigure the new meter's format.

4. The consumption units are set in the meter description in the K2n spreadsheet.

5. For a number of BEMS based metering systems the meter data is able to be collected at high precision suitable for diagnostics and control assessment as well as overall consumptions, or at more variable intervals suitable for overall consumption needs only. For K2n the more detailed precision metering setup is required.

3. ADDITIONAL VALUABLE FEATURES FOR A METERING SYSTEM

1. Install the most accurate meters for each situation. This reduces uncertainty in use of the data for both billing and operational needs. For best accuracy, keep the meter between 5 - 30°C. Further details on meter accuracy can be found at:

http://www.legislation.gov.uk/uksi/2006/2647/made/data.pdf (Gas)
http://www.legislation.gov.uk/uksi/2006/1679/made/data.pdf (Electric)

2. Ensure that the meter resolution is appropriate to the recording time interval and load being metered. For example, a 1 kW motor being recorded at 15 minute interval would need a meter and recorded data resolution of at least 0.1 kWh to show data useful to operational decisions as well as cumulative consumption. This also affects the overall accuracy of the meter. Commonly many energy meters resolve only to 1 kWh.

3. Record the actual meter reading at each interval, not just the consumption in the time interval. This provides more robust data and overall consumption figures should the data collection fail for a period.

4. Avoid being tied into one meter data collection service when specifying your metering. This will often be a requirement for a number of meter suppliers, this means that the investment is wasted should the provider go out of business. It is possible to get meters/systems which do not have this stipulation.

5. There are meters/sensors which can be individually connected directly to the internet via LAN, GPRS, etc. and can send data to a user-configurable address. These should be the preferred choice if available, as there is less likely to be a complete failure of the data collection system in this instance. Ideally a direct LAN connection will also be used to transmit data to the Internet to avoid ongoing data collection charges from using mobile phone technology.

6. Meters should ideally PUSH the data to the Internet, not rely on an external connection to request (or PULL) the data from it. This is for network security reasons. Whilst valuable for real-time queries and meter setting alterations, there is NO requirement for PULL type functionality for the K2n platform. If real-time data collection is required it is probably easier to PUSH the data at sub-hourly intervals to a local data collector/aggregator from which this data can then be viewed. K2n could also be used for this service, but higher charges will apply due to the demand on the system.

7. Within the UK, installed Gas and Electricity Meters used for Billing purposes should be on the Ofgem approved list of meters: https://www.ofgem.gov.uk/sites/default/files/docs/2004/02/5876-meterapprovalverification_0.pdf or at https://www.gov.uk/uk-nationally-approved-gas-and-electricity-meters

8. Since 2006 within both the UK and EU meters should be approved as meeting EU MID standards for their use: https://www.gov.uk/guidance/mid-approved-gas-and-electricity-meters. For the purposes of reliable metering, it is recommended that all meters installed meet the MID approved AND certified standard.

9. Other sources of information on Gas and Electricity meter type and errors can be found at: http://www.legislation.gov.uk/uksi/2006/2647/made/data.pdf and http://www.legislation.gov.uk/uksi/2006/1679/made/data.pdf

4. OTHER SOURCES OF DATA

Many items of HVAC equipment are now capable of being connected directly to the Internet themselves to enable remote fault detection amongst other capabilities. Often this data can also be sent directly to K2n and can replace one or more separate meters if available. Examples are Air Handling Units (AHU) and Pumps, which can provide everything from flowrates, energy provided and sensor points, through to consumed energy and specific energy figures.

Some of this equipment is also capable of acting as a data aggregator if required. The data formats required are the same as for meters.

5. SENSOR DATA COLLECTION

You will need at a minimum to provide a sensor data collection system covering representative internal and external Temperatures if you wish to access the full reporting and diagnostic possibilities of the K2n platform. Like the meters, this system should be capable of automatically collecting meter reading and sensor data at sub-hourly time intervals, then storing and transmitting this data directly to an email address you will be given from K2n upon submitting the Building description spreadsheet.

Sensor data can often be collected, stored and transmitted using the Meter Data system, or via in-built sensors on installed building services components.

6. ANNUAL COSTS

The annual costs will be those related to the maintaining of the metering system, the costs of the data service and any support you may use. An indication of the annual cost for the K2n platform for each building or system will be provided on request.