

THE BUSINESS CASE FOR SMART METERING

TECHNOLOGY OVERVIEW

Smart metering technology is an electronic device that measures consumption of gas or electricity in real-time and communicates the information to a central location for monitoring and reporting. Smart meters also enable two-way communication between the meter and a central system.

Smart metering enables energy cost savings by making possible the implementation of detailed energy monitoring, targeting and reporting, at a site or sub-meter level, and to proactively manage consumption and demand through the real time management of energy consuming equipment/processes.

Energy Monitoring Targeting and Reporting (MT&R) with smart metering can be defined as follows:

- Monitoring is the regular collection of information on energy use to establish when and why energy consumption is deviating from an established pattern, and as a basis for taking management action where necessary.
- Target setting is the identification of levels of energy consumption and/or energy intensity (e.g. kWh per megalitre, kWh per tonne), which is desirable as a management objective. Targets can be set based on historical performance, industry best practice benchmarks or theoretical best achievable performance.
- Reporting involves “closing the loop” by putting the management information generated from the monitoring process in a form that enables ongoing control of energy use/intensity, the achievement of reduction targets, the variance against a target, and the verification of savings. The reporting phase not only supports management control, but also provides for accountability in the relationship between performance and target.
- Sub-metering with smart meters can be used to meter energy consumption by main energy intensive processes or business units and further drive energy management improvements. The additional cost of measuring energy intensity performance at an equipment/process level needs to be compared against the expected energy savings benefits of further granularity of the sub-metering arrangement.

Sub-metering with smart meters allows for energy consumption to be monitored at an equipment or operational level. Accountability of energy consumption to an operational level will:

- decrease wastage (such as turning off lights in unused spaces, identifying compressed air leaks);
- change energy consumption behaviour (such as over-riding energy saving controls, using compressed air for cleaning, etc); and

- increase innovation (operators bringing forward energy saving projects, scheduling of equipment shut-off, etc).

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IS IT SUITABLE FOR YOUR MEAT PROCESSING FACILITY?

For any site interested in improving energy performance, some level of smart metering is a good place to start. Firstly, most sites have a smart meter for billing purposes at site level. The data collected by your utility meter may be sufficient to give you the data you need. Many energy retailers will allow you to communicate with the utility meter and use this data for continuous monitoring.

When considering investing in additional smart meters, sub-metering and energy monitoring software for your facility, understand that increasing measurement on your site is valuable only if the information collected will be used. To be successful, your management team will need to be involved to develop Key Performance Indicators (KPIs), targets and a reporting system to embed energy into your operating management processes and increase energy accountability across your production staff.

HOW TO DEVELOP YOUR BUSINESS CASE

Steps to take when developing a business case to increase monitoring and reporting capabilities:

- Obtain commitment from your management team
- Understand your facility's energy usage and cost
- Understand current operational data management systems
- Assess the viability of sub-metering

OBTAIN COMMITMENT FROM YOUR MANAGEMENT TEAM

Have a meeting with the operational manager of your facility. Explain MT&R, energy productivity and the benefits of energy management; for example, internal targets have been found to result in about 5 – 15% energy savings.¹ Discuss the benefits of real-time energy data with your operational management team and finance team.

UNDERSTAND YOUR FACILITIES ENERGY USAGE AND COST

Compile your energy bills for the past 12 months and determine your annual consumption. Contact your electricity, gas or water retailer to determine if you have interval meters on-site (most sites do). Request half-hourly interval data for the past 12-months. Graph the typical load of your facility by graphing the time of day vs. the power demand.

Understand how your energy use relates to various energy drivers by analysing energy usage against site parameters such as production levels, ambient temperatures, operating hours, type of product, etc. Breakdown the site's energy use by equipment sizing and engineering calculations, reading sub-meters or tonging circuits.

UNDERSTAND CURRENT OPERATIONAL DATA MANAGEMENT SYSTEMS

Assess energy KPIs as an addition to current site targeting metrics. When developing activity-based energy key performance indicators, you need to assess the interest/validity of the indicators by confirming the strength of the correlation between energy consumption and the proposed activity based measurement (e.g. pumping energy consumption with volume of fluid pumped). This can be done as a once-off exercise using historical data (possibly through temporary data logging). Assess how KPIs can be enhanced with increased sub-metering to operational levels.

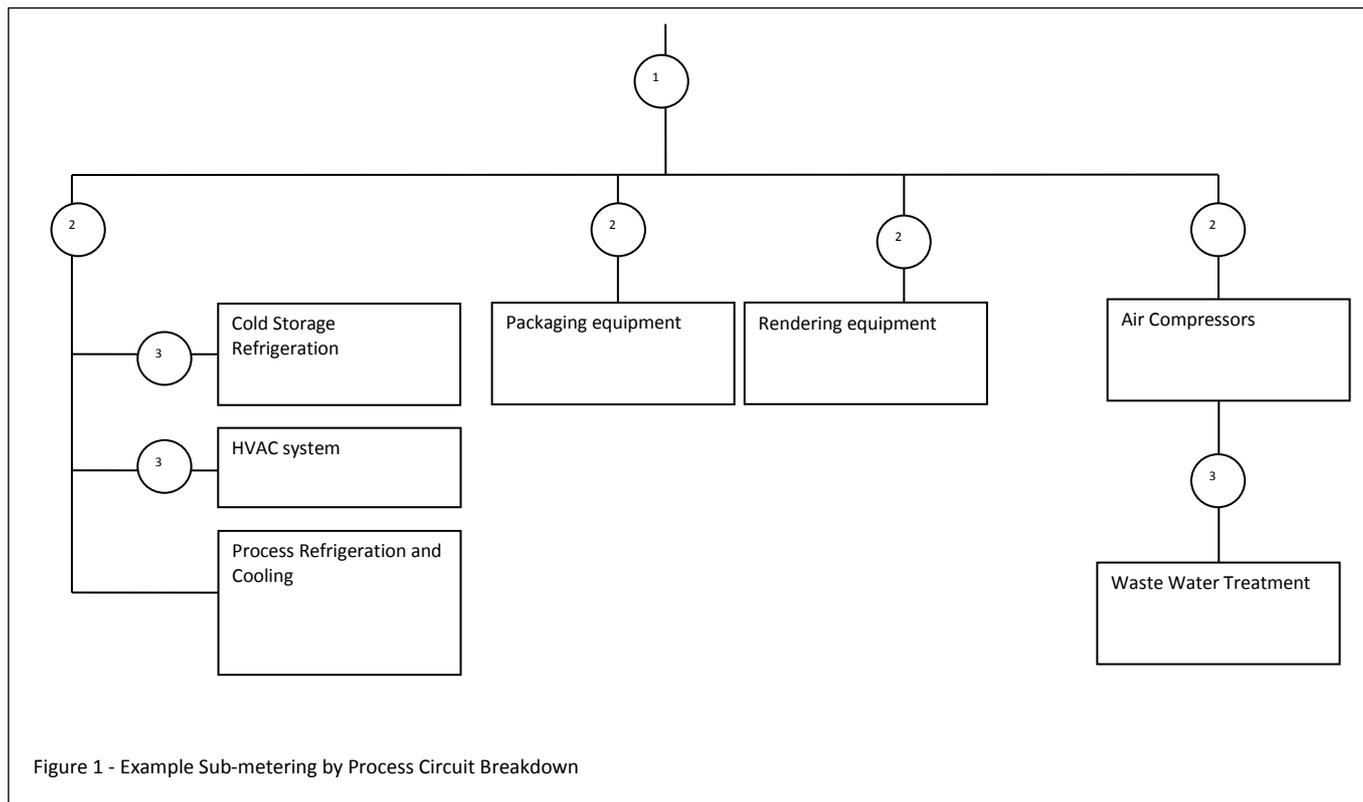
¹ 'Industrial Energy Management Guide' (New Zealand government, 2010)

Investigate the provider of your site's automatic direct control system and data interface software. Determine if this provider has integrated energy management add-ins or partners with an energy management software provider. If so, determine the costs with this provider for your facility.

If your site does not have an automated control system, investigate the data management used by the financial team to see if that software provider has an energy management component.

Investigate the plan for SCADA system upgrade/replacement, energy monitoring targeting reporting inclusion in control system rolled in with other upgrades can bring the implantation cost down significantly.

ASSESS THE SUB-METERING OPPORTUNITY AND COST



Ideally to fully manage your site, you would real-time meter every energy using component; however, you need to weigh up cost to implement versus the expected energy savings benefit.

To do this, you need to identify operational sub-categories or different business operational units within you facility. Review the site's electrical circuit diagrams to see if circuits are split for easy division of electricity usage by operational business unit. Identify the number of sub-metering points.

Figure 1 is an example of a site's wiring diagram by plant area. It is clear that the Refrigeration and HVAC are on the same circuit. Also the air compressors and wastewater treatment plant are on the same circuit. The circles are potential locations for electricity smart meters. 3 levels of potential implementation have been identified. Level 1: site-wide; level 2: 4 main circuits, level 3: by functional process unit.

Add the number of meters up for each implementation case and cost out the purchase and installation of these meters. Often the incremental software costs for increased number of meters is minimal as compared to the initial out-lay for the software set-up; thus, the majority of the cost of increased metering is the cost of the meters, switching alterations and installation.

EXAMPLE COST-BENEFIT ANALYSIS

A meat processing plant uses \$1 million in electricity and \$3 million in gas annually. They have decided to install energy monitoring software for use as an energy management tool. The project is to connect the data into their SCADA system and install wireless smart meters around the plant. They have estimated a 5% energy savings for a single meter feed and 15% energy saving if they install 10 meters. Below is the assessment of each option.

$$\begin{aligned} \text{Annual Savings (1 meter)} &= \$1,000,000 / \text{yr} \times 5\% = \$ 50,000 \\ \text{Annual Savings (10 meters)} &= \$1,000,000 / \text{yr} \times 15\% = \$150,000 \end{aligned}$$

The cost to implement is \$120,000 for the software and \$13,000 per meter upfront, plus annual costs of \$2,000 per meter for the wireless maintenance, and \$25,000 annually for the software license. Table 1 compares the example of 2 options for sub-metering with smart meters. As you can see, in this case the payback for installing additional meters is lower than installing a single meter; the increase in expected savings are greater than the increase in capital cost.

	1 meter	10 meters
Capital Cost (+year 1 software cost)	$\$120,000 + \$13,000 + \$25,000$ = \$158,000	$\$120,000 + \$130,000 + \$25,000$ = \$275,000
Annual Cost (year 2 onwards)	\$27,000	\$45,000
Electricity Savings Estimate	5% of total annual	15% of total annual
Electricity Savings	\$50,000	\$150,000
Net Annual Savings	\$23,000	\$105,000
Simple Payback	5.7 years	2.2 year

Table 1 Cost Benefit Results for Sub-Metering Example