atamate

Atamate Guide to

Energy Metering

Overview

This white paper covers the use and regulatory requirements of various types of meter and the development programmes underway to incorporate them into the Atamate platform. It is aimed at domestic and small-scale non-domestic consumers rather than at high-energy industrial users.

A meter is an instrument for measuring chargeable utilities such as electricity, gas and water. Different types of meter are used at various levels of usage from the total energy used by a property to the energy used by a single device or service such as a fridge or an air-conditioning unit.

The Atamate platform can incorporate all types of meter and store their data which offers four major benefits:

- Financial flexibility: energy suppliers offer a range of different tariffs so measuring energy costs in real-time helps a consumer to choose the cheapest.
- Tenant pricing: for a property sub-let to different tenants but with utilities supplied through a single contract, metering allows a landlord to fairly split the utility costs between tenants.
- Performance feedback: monitoring energy use can help to optimise it, whether applied to the building as a whole or to single devices within the building.
- Regulatory compliance: A property owner can use the recorded data to demonstrate that they are conforming with regulations regarding both energy performance and billing of tenants.

This white paper will show how integrating various types of meter with the Atamate platform can deliver all four benefits.

Meters can operate at four different levels (Fig.1, p3):

- Property meters measure the total consumption of that utility within the property.
- Sub-tenant meters measure the utility used by each tenant within a property supplied by a single contract with the utility supplier.
- Energy submeters are placed on electricity sub-circuits within a property to measure the load on each sub-circuit.
- Device meters measure the energy usage of a particular device, which may be an appliance like a gas or electric cooker or part of the building services such as the extractor fan that powers the ventilation system.

Property meters are usually the responsibility of the utility provider but all of the other meter types would be installed and monitored by the property owner.

The Atamate platform can integrate any digital meter, allowing its data to be read through the user interface which can be accessed through any internet-enabled device. Atamate also records the data, making it available for analysis and reporting later on.

This white paper will describe the practicalities of metering at each of the four levels described above and how Atamate makes best use of the data those meters provide.

Overview

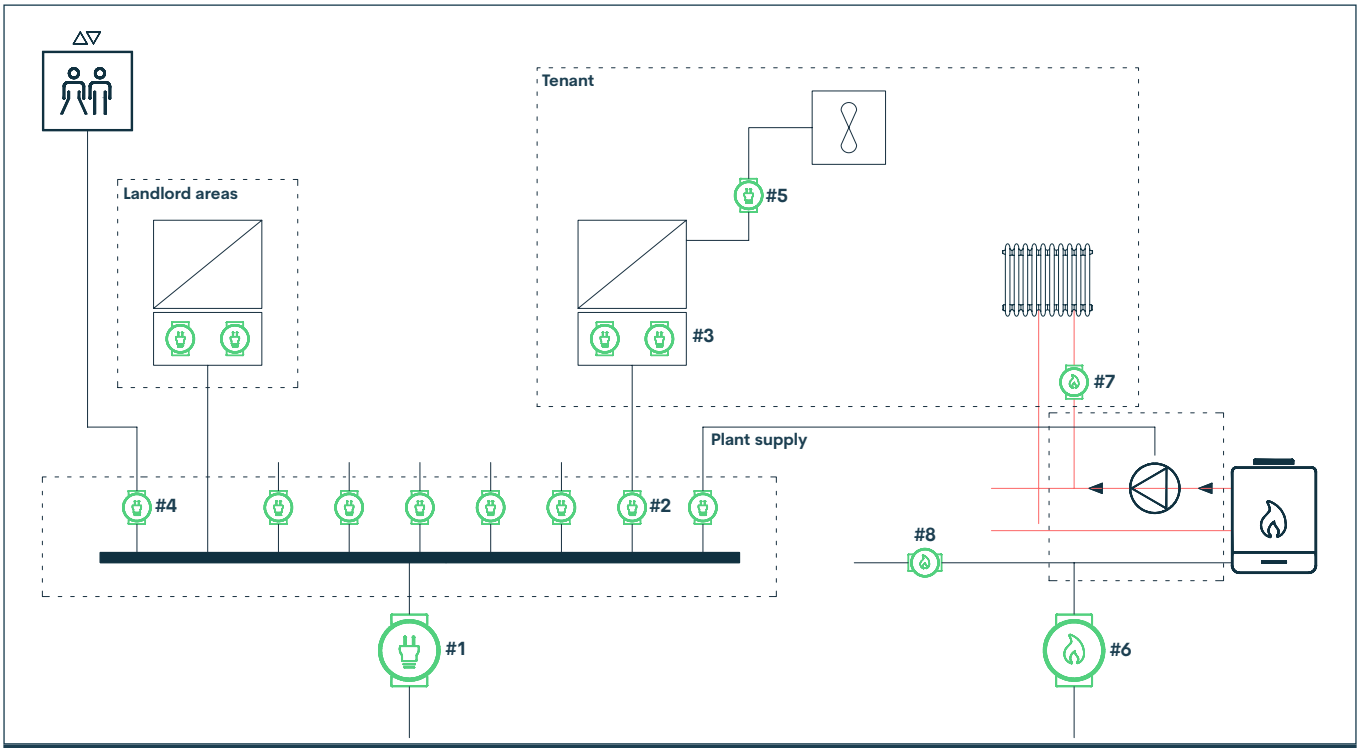

Figure 1: Diagram showing levels of metering

Electricity:

#1 - Property electricity meter for billing, when inteligent can assist with grid demand control and load balancing

#2 - Sub-tenant meter, when part of a building is sub-tenanted and the landlord intends to bill for energy use, a meter is required. This must be MID compliant (monitoring voltage and current)

#3 - Energy submeters, required by building regulations to determine end use. Often utilises split distribution boards to separate small power and lighting circuits

#4 - Component sub meter, as with sub circuit monitoring, some times large loads will be metered at the main panel, typically this includes items such as lifts or chillers

#5 - Device sub-meter, sometimes it is useful to monitor devices at the final circuit level to understand energy use

Gas:

#6 - Utility meter for billing

#7 - Heat meter, to determine heat usage on the water side of boilers, when used for building this needs to be MID compliant

#8 - Gas sub-meter to understand energy end use in line with building regulations

Property meters

A property meter is placed at the interface between a property and the national electricity, gas or water grid, which means that the practicalities of property metering are affected by changes to the national grids as well as changes to a property.

In Britain, a profound change in how electricity is generated, distributed and consumed is ongoing.

For the consumer, the most visible change is in metering and charging. While the change is driven by changes in electricity provision, the metering and charging of mains gas metering are being upgraded in parallel.

In the past, most electricity was generated by coal-fired and nuclear power stations which allowed the level of input to be controlled directly. Most of the input from coal has now been replaced by wind turbines and solar power which has massively reduced carbon emissions. It has also changed the nature of supply to the national grid as wind and sunlight fluctuate in their availability, leading to fluctuations in the price that energy distributors pay for the electricity they sell to consumers.

As the generation side of Britain's electricity infrastructure has been changing, so has the consumer side.
Two trends likely to become more significant are:

- Onsite generation, which may be the generation of electricity through photovoltaic cells, heating of water using solar-thermal technology or converting mains energy into heat to supply a heat network. Any of those may form the basis of a peer-to-peer network in which excess energy is sold locally outside the provisions of the national grid.
- Electric cars are likely to change patterns of consumption as they become more common. They are usually charged overnight, which is currently a time of low demand and low cost to the supplier. As they become more common, they are likely to change patterns of demand and pricing.

The smart meter programme

The changes in generation and demand are driving a major revision to the way gas and electricity are metered at the property level (see Box 1: Responsible organisations). From the consumer's perspective, the most visible part of the programme is the smart meter rollout.

In the past, each property's energy meters were managed by the energy suppliers. Britain is now in the late stages of a transition toward centralising meter data as part of a move toward a 'smart grid'. The main reason behind it is to facilitate the overall management of the national gas and electricity grids, improving efficiency by cutting the amount of energy supplied to the national grid and not used. The efficiency improvements are intended to make cheaper energy available to consumers as well as supporting the policy of cutting Britain's net carbon emissions to zero by 2050[1].

In the past, energy suppliers would read each consumer's meters every few months to calculate their bills. The smart grid's meters transmit data to the supplier as it is used which allows the national grid to be managed using real-time data on energy usage across the country. The same data is available to the consumer themselves, which they can use to improve the efficiency of their energy use patterns or to compare suppliers to choose the cheapest for their needs.

A building control system like Atamate can read and store meter data for later analysis. However, what it can access and how depends on which type of meter is installed.

Property meters

Energy meters fall into three categories:

- Legacy meters, sometimes called dumb or traditional meters, record the mains gas or electricity being used by a property and show their results on a display that must be manually read.
- Advanced meters carry out automatic meter reading (AMR) by transmitting data from the gas or electricity meter directly to the supplier through the phone network.
- Smart meters enable two-way communication between the consumer and the supplier. The supplier reads the meters in the same way as with AMR but the data is also accessible to the consumer through a digital display that shows the energy usage in terms of kWh, cost and carbon emissions.

Replacing legacy meters with AMR and smart meters is part of the British industrial strategy and involves mains gas as well as mains electricity even though the gas network has not seen the dramatic changes that apply to electricity. It has been underway since 2009 and has been divided into three phases:

Phase 1: AMR for large scale consumers

Since 2014, energy suppliers have been required to provide advanced meters to any property that meets either of the following criteria[2]:

- Gas consumption of >732MWh/yr OR with a gas supply capable of flowing more than 11m3/hr.
- An electricity transformer on-site OR falling into electricity profile classes 5-8 according to the Balancing and Settling Code version BSCP516[3].

In practice, that means that any building that receives three-phase power directly from the national grid is likely to need an AMR meter although that is not the criterion specified in the regulations.

The AMR-capable meter is required to communicate data to the supplier at intervals of no more than 30mins but beyond that, regulation is restricted to enforcing the agreement between the supplier and the consumer. The Atamate platform can connect to any advanced gas or electricity meter through a Modbus connection.

Phase 2: SMETS1 smart meters

Smart meters are intended for domestic and non-domestic consumers whose energy consumption falls below the threshold that would require an advanced meter meaning that both the following criteria are met:

- Annual gas consumption does not exceed 732MWh/yr.
- Electricity profile classes are 1-4 according to the Balancing and Settling Code[3].

The two parts of the smart meter rollout programme h ave involved two different Smart Metering Equipment Technical Specification (SMETS) specifications which define two types of meter: the SMETS1 and SMETS2. The difference between them is not in the meter itself but in the way they communicate with the energy supplier.

The SMETS1 meters rolled out in the first part of the programme connected a property's gas and electricity meters through a home area network at 2.4GHz using the Zigbee protocol[4]. The network incorporated a display that allowed the consumer to see the property's power usage and the cost and carbon emissions associated with that power usage in real-time. At the same time, a gateway connected to the electricity meter, which can draw power directly from the mains, communicated the property's energy usage to the supplier through the 3G phone network.

Property meters

The exchange of information between the supplier and the consumer is handled by a third-party smart metering system operator (SMSO) contracted by the supplier and led to the major drawback of the SMETS1 meters: if the customer changes to a supplier whose meters are managed by a different SMSO, the customer's meter will 'go dumb' and no longer gives cost information.

Because the smart meter rollout followed the AMR rollout, some small non-domestic customers were exempt from the requirement to install a smart meter until their AMR-compatible meter needs replacing[5]. To be exempt, the customer must be defined as an exempt microbusiness according to the following criteria:

- The meter must have been installed before 5th December 2018 OR before 31st December 2020 under the terms of a contract signed before 6th April 2016.
- The business must have electricity consumption <100,000kWh/yr OR gas consumption <293kWh/yr OR less than 10 full-time employees OR an annual turnover below 2,000,000€.

Phase 3: SMETS2 smart meters

The second phase of the programme is to replace the SMETS1 meters with SMETS2 meters which communicate with the energy supplier using a purpose-built network managed by the Data and Communications Company (DCC).

Because the SMETS2 meters use the same network irrespective of the supplier, their function is unaffected if the customer changes supplier. At the time of writing, the DCC is in the process of converting SMETS1 installations to SMETS2[6] which will allow change of energy suppliers without the smart meter going dumb and will restore smart meters that have already gone dumb.

Atamate developments: access to SMETS 2 metering data

Atamate accesses a building's metering data through a consumer access device (CAD). Atamate can access the CAD in two ways:

- The preferred option is to use an ethernet cable to connect the CAD to the Atamate hub via a local area network.
- Atamate can access the home area network wirelessly but the connection will need to be reset whenever a new router is installed, such as when the wifi is upgraded or the provider is changed.

Atamate uses the meter data in the reports it generates, allowing comparison of energy costs and estimated carbon emissions to be plotted against other aspects of the building's performance.

An alternative approach to accessing meter data is hrough subscription to the DCC, which is available to the owners of any building with a SMETS2 installation. However,
Atamate has opted for the more direct approach of using the CAD for the following reasons:

- The DCC charges for access to metering data which would cost at least as much as installing a CAD.
- The DCC supplies data in half-hourly packages while the CAD gives updates that may be as frequent as every ten seconds.
- Access to DCC data is vulnerable to network interruptions which do not affect the CAD.

Atamate can also read data from any water meter (see Box 2: Water meters) that produces a digital output. However, digital water meters are still unusual in British properties, most of which use mechanical meters that require manual reading, so giving Atamate access to water data usually involves installing a new meter.

Property meters

Box 1: Responsible organisations

There are several organisations involved in the smart meter program with the responsibilities as follows:

The Department for Business, Energy and Industrial Strategy (DBEIS) initiated the policy.

The Office of Gas and Electricity Markets (Ofgem) is the government regulator responsible for regulation and reporting of the smart meter program. Individual energy suppliers are responsible for supplying smart meters and for the management of SMETS1 meters.

The Data and Communications Company (DCC) is responsible for communication between all SMETS2 meters and energy suppliers and for migrating SMETS1 meters to the SMETS2 standard.

The DCC is also responsible for implementing and enforcing the Smart Energy Code (SEC) which defines the rights and obligations of all parties involved in the smart meter programme.

Smart Energy GB is a not-for-profit organisation funded by energy suppliers to lead a 'programme of national engagement'[7] so although they are the most publicly visible organisation involved in the smart meter programme, they are not involved in distributing or managing the meters.

Box 2: Water meters

Like energy, water is a utility that is bought from a supplier and delivered through a national network. The supply may be metered but it has not been undergoing the same process of revision.

The default system for water billing is to charge a fixed rate based on the value of the property, which is divided into a standing charge to cover overheads, an estimate for the volume of water likely to be used by that property and in some cases, a sewerage charge.

A meter allows the charge to be based on the measured volume of water used, which may lower the bill if usage is below the average for that type of property. A meter can be requested from the supplier who should fit it within three months free of charge although they may not be able to do so if:

- The water supply is shared so it is not possible to place a meter on a single pipe into the property in question.
- The incoming water pipe is inaccessible.

If a supplier refuses to supply a meter for one of those reasons but the consumer does not agree, they may refer the dispute to the regulator.
Regulation of water supply in Britain is devolved to the following bodies:

- Ofwat is the regulator for England and Wales.
- The Water Industry Commission for Scotland is the regulator for Scotland.
- The Utility Regulator is the regulator for Northern Ireland.

Sub-tenant meters

When a property has a single occupier, the property meter is all that is needed to calculate the bills for the occupier. When the property with a single property meter is sub-let to different tenants, the landlord is faced with the problem of how to fairly allocate the costs between tenants who may use different amounts of each utility.

The best approach is to use sub-meters that measure the use of each utility by each tenant. Ideally, the sub-meter is attached to a single pipe or cable that supplies the part of the property let by each tenant. Where there is no single pipe or cable, it may be necessary to integrate the measurements from several different sub-meters or to use sub-circuit or device meters (see below).

Any individual or company who charges tenants for utilities must meet certain legal requirements. What they may charge depends on the type of utility:

Electricity and gas

If a landlord buys gas or electricity from a supplier and charges their tenants, they are legally a reseller. Ofgem forbids a reseller from making a profit through resale so they are only able to charge the cost they paid to the supplier plus a service charge sufficient to cover any overheads[8].

There is no legal requirement to use sub-meters but they do offer the fairest way to allocate bills by measuring who uses what. In the absence of sub-meters, possible approaches include:

- Splitting the costs equally between the tenants.
- Inclusion of utilities costs in the rent.
- Allocating costs based on a reasonable estimate, possibly based on device meters (see below).

Any sub-meter used to generate bills must meet the MID standard (see Box 3: The MID standard).

Water

The resale of water to tenants operates in a similar way to the resale of gas and electricity, in that a tenant may only be charged at the rate that the reseller pays the supplier plus a service charge.

The reseller may allocate bills in any way that is reasonable and is transparent to the tenants. As with gas and electricity, there is no requirement to use a sub-meter but if a sub-meter is used, it must comply with the MID standard (see Box 3: The MID standard).

The requirements are published by Ofwat[9] and the Water Industry Commission for Scotland[10] (see Box 2: Water meters). Northern Ireland's Utility Regulator has published no requirements for the resale of water.

Heat networks

A heat network uses a central plant to supply temperature-controlled water to different properties. Despite the name, the regulations cover networks of chilled water as well as to networks of hot water or steam.

Heat networks are regulated by the Office for Product Safety & Standards (OPSS) which is part of the government's Department for Business, Energy and Industrial Strategy (DBEIS).

The OPSS must be notified of any heat network before it enters operation and subsequently renotified every four years[11]. The OPSS distinguishes communal heating, where the network supplies a single building, and district heating, where the network supplies more than one building or site. In practice, the regulatory differences between the two are minor. The salient point is that any system in which a single plant supplies two or more users, whether they are renting different flats in the same building or the owners of different buildings on an industrial estate, is legally a heat network.

Sub-tenant meters

Because a heat network heats or chills water onsite, it is regulated as an energy generator rather than a reseller which means that the operator may make a profit. The regulations were amended in November 2020 with one of the main changes being to how the network should be metered.

A district heating network is required to have a single meter for every multi-occupancy building that it supplies.

Regarding the customers themselves, metering requirements depend on which of the following three categories a building on the network falls into:

- Viable buildings must have a meter for each customer within that building. The class included a building on a district heat network that was built or connected before 27th November 2020 or a communal heating network that was built or connected before 1st September 2022. It also includes buildings that were built and connected before those dates for which meters had been installed under previous regulations.
- Exempt buildings have no requirement to meter each customer. Exemptions apply to supported housing, almshouse accommodation, purpose-built student accommodation or buildings in which at least 10% of the dwellings are subject to leasehold interest that makes separate metering or billing impossible.
- Open buildings are those that do not fall into either the viable or the exempt category. The requirements depend on technical and financial feasibility which is assessed according to online tools[12] managed by the DBEIS.

The above categories are applied to the buildings on a network rather than the network itself, meaning that a district heating network may supply buildings that have different metering requirements.

The meters used to assess consumption by each customer should comply with the MID standard (see Box 3: The MID standard) although the International Organisation of Legal Metrology (OIML) R75:2002 standard[13] is also acceptable.

There is also be a requirement to provide heat cost allocators, thermostatic radiator valves and hot water meters under any of the following circumstances:

- There is more than one final customer in the building.
- The network supplies hot water for both the taps and the heating system.
- It is more technically feasible and/or cost-effective to install them than to provide a single meter for each customer.

The meters used to comply with those requirements must comply with the BS EN 834:2013[14] standard.

Atamate developments: tenant billing

Atamate can read sub-meters and use them to calculate each tenant's utility use.

Most types of sub-meters require a cabled connection that can be connected to the Atamate sensor unit, usually through a Modbus connection. The sensor unit can then communicate the data to the hub through the Atamate wireless network.

An Atamate network has sensor units throughout a property, which allows it to read meters in different parts of the property without needing extensive cabling.

The hub stores and processes all meter data and uses it to both allocate bills and supply each tenant with a breakdown of their utility usage. Providing a detailed report of energy usage has three benefits:

- It may help the tenants identify and correct inefficiencies in their utilities use.
- It meets the legal requirement for any invoice to show how it was calculated[15].
- It can be used to produce the annual Display Energy Certificate required for some non-residential properties (see Box 4: Display energy certificates).

Sub-tenant meters

Box 3: The MID standard

The most widely applied standard for all types of meter is the European Union's Measuring Instruments Directive (MID)[16]. Any meter certified to MID standard will also bear the CE mark. All UK regulatory bodies accept it and may challenge the use of any meter that does not meet the MID standard.

Gas and electricity meters that met the UK standards in force before the adoption of MID may still be in use as long as they were installed before 30th October 2016[17].

In the case of heat meters, the British Standards Institute (BSI) standard BS EN 1434[18] is also acceptable as it is harmonised to the MID standard.

The image below shows the MID certification on a utility meter, which includes the following elements:

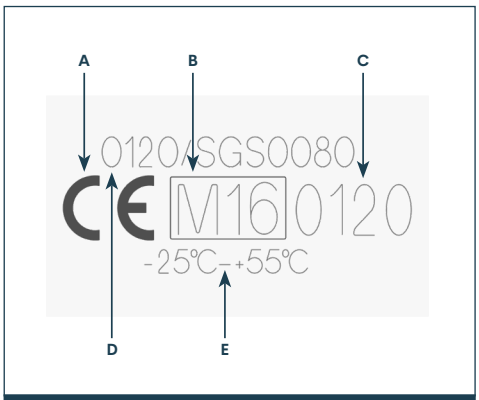

Figure 2: MID certification on a utility meter

- **A** – The CE mark certifies that the device conforms to the relevant EU standards and is an integral part of the MID certification.
- **B** – The 'M' in a closed box indicates that the item is MID certified and '16' indicates that it was certified in 2016.
- **C** – A four-digit code for the notified body[19] that issued the certification. 0120 indicates SGS United Kingdom Ltd[20].
- **D** – The full reference for the MID certificate issued to this device.
- **E** – The temperature range at which the device has been certified to operate. At the time of writing, no plans have been published to replace the MID after the UK's withdrawal from the European Union.

Energy submeters

The electricity supply within a property is usually divided into a set of sub-circuits, each of which has one or more devices or services attached to it. The main use for sub-circuit metering is in the non-domestic setting.

Non-domestic buildings

The UK building regulations covering energy conservation were revised in 2006 and since then, it has been mandatory for any newly built[21] or renovated[22] building to be able to report 90% of its energy consumption according to end-use categories. To meet those requirements, designers often design the building's electricity supply so that each circuit covers one use category. For example, some circuits may be dedicated to lighting, some may power the air-conditioning while others may be dedicated to a single device with a high energy demand such as a lift or a chiller.

Older buildings would not have been designed around the current regulations, which came into force in 2006, but they often have sub-circuits that are predominantly or exclusively dedicated to a given end-use. Metering those sub-circuits may not be a regulatory requirement but it can help a building manager identify areas in which energy savings can be made.

Domestic buildings

The main use for energy submetering in the domestic sector is to allocate bills to tenants where sub-metering is not possible. In some properties, such as houses built as family homes and subsequently divided into flats, there may not be a single cable carrying electricity to each tenant but there may be sub-circuits that exclusively or predominantly serve each tenant.

Metering some or all of those sub-circuits could be used to assess what proportion of the property's electricity each tenant uses, which would meet the regulator requirement for a reseller to fairly allocate the bills.

Atamate developments: integrating energy submeters

The building regulations are based on the Chartered Institute for Building Service Engineers (CIBSE) metering guidelines[23], which underline the point that a meter is only useful if it is read on a regular schedule. Atamate facilitates that process by integrating all energy submeters into a single platform. The data is stored and available for reports that may be used to facilitate building management or to meet regulatory requirements such as the provision of DECs (see Box 4: Display energy certificates).

The Atamate platform uses the Bluetooth wireless protocol but every Atamate sensor unit has a Modbus socket, enabling it to connect the meter to the wireless network even if the meter is not wireless-enabled. Once the meter data has been transmitted to the hub, it is stored in the cloud.

Many more recent installations already have their energy submeters on a Modbus network so a single connection between a meter and a sensor unit would allow Atamate to read all the meters.
In older buildings, the meters may not be networked so each meter would need to be connected separately.

Device meters

A device meter monitors the energy use of a single device. A device may be an appliance like a fridge or a washing machine or it may operate a building service like a boiler or water pump.

There are two major reasons to monitor devices:

- To continually assess its performance.
- To combine data from multiple meters that build a pattern of energy use across a whole building.

Optimisation

Reviewing the energy use by different devices can enable them to be controlled for comfort and energy efficiency.

It can also indicate maintenance requirements, usually by measuring how much energy a device usually uses to perform a particular task.

For example, a building manager may evaluate how much electricity an air conditioning system uses to achieve a given temperature change. If it is consuming more energy to achieve the same change, it may indicate that the filters need to be cleaned.

Alternatively, a device user may be able to apply information on energy use to their specialist knowledge of the device. For example, continuous assessment of a cutting tool's performance can inform its user when the blade needs changing because blunt blades need more energy than sharp blades.

Meters used for optimisation are not subject to the same standards as meters used for billing.

Atamate developments: device monitoring and control

Atamate can use device monitor data for optimisation by setting up alerts tailored to the device in question.

In the examples above, a building manager could set a threshold for how much energy an air conditioning system needs per degree of cooling or a cutting tool's user could define how much energy it uses per minute of operation. If either device exceeds the predefined thresholds, Atamate sends an automated alert to the person responsible for maintenance.

Box 4: DIsplay energy certificates

Certain types of non-domestic building are required to produce display energy certificates (DEC) to show how much energy they are using and what they are using it on, DECs should be produced on an annual basis for any building with a floor area over 1,000m^2 if:

- It is occupied by a public authority.
- It is occupied by an institution providing a public service.
- It is frequently visited by members of the public.

The DEC is produced by comparing the building's energy use to a set of benchmarks published by CIBSE, which vary according to the class and use of the building[24].

Meters are needed to derive the data needed to produce the DEC although which meters are used and how will depend on the building. For example, a single building occupied by council offices could derive its data from a single meter for each utility. A shopping centre that contains a café, which falls into a different class to shops, may need to derive its data from sub-tenant, sub-circuit or possibly even device meters depending on how the utilities are provided.

Why you want Atamate to collect meter data

System change

By metering where the energy in a building is being used, it is possible to identify inefficiencies that can be remedied.

For example, many buildings that house workplaces have a central boiler that provides hot water to both the heating system and to the bathrooms. In one case, a newly installed Atamate system found that the pumps powering hot water distribution were not switched off but were pumping water that was neither heated nor used. Once the problem was identified, the building manager was able to ensure the pumps were switched on and off at the same time as the boiler.

Such a change can be made manually if the relevant system is not automated, enabling the Atamate platform to deliver energy savings when retrofitted to a building where full automation may not be possible.

Behaviour change

A behaviour change involves the actions of the people in a building, which is particularly relevant in domestic buildings. The internal environment of a home is usually governed by each individual who lives in it rather than a designated manager.

Comparing meter data with environmental monitoring can reveal common inefficiencies such as the heating being used while the windows are open or appliances being left on unnecessarily.

As with system changes, behaviour changes can be made either manually or through the Atamate platform, depending on whether the relevant device or service is automated.

Understanding a building's fabric

A building's fabric envelope separates the thermal environment inside the building from the thermal environment outside. The internal environment may be heated or cooled to a temperature above or below the outdoor temperature.

The less heat energy that passes across the fabric, the less energy is needed to maintain a temperature difference. There are two key measures of the ways by which heat energy is lost through the building fabric:

- U-value: a measure of the heat energy conducted across the walls and windows that make up the building fabric.
- Airtightness: a measure of the flow of air through the building fabric, requiring energy to be used to heat or cool the air coming in.

The u-value and the airtightness are assessed in the planning and commissioning stages of any new building or major renovation.

Atamate can continuously assess the building fabric by combining temperature data from sensor units with meter data.

The u-value for a building, or from a room within a building, can be calculated by metering the energy used to maintain a temperature difference across a wall, floor or ceiling. At the same time, air leakage through a room or building can be measured using a pressure sensor inside a building that assesses the small changes in pressure inside the building caused by changes in wind speed.The data generated has two main uses:

- When planning renovations to an existing building, identifying the deficiencies in its fabric will facilitate planning for the best achievable energy efficiency.
- When a newly built or renovated building has been commissioned, ongoing post-occupancy evaluations of the fabric performance can identify any parts of the building that are particularly prone to losing heat so that they can be remedied.

Why you want Atamate to collect meter data

Tariff selection

The move toward the 'smart grid'1 allows energy suppliers to see the fluctuations in the prices they pay for electricity in real-time, which allows that cost to be reflected in the bills to their customers.
Different suppliers offer different prices but most tariffs follow one of the following structures:

- Fixed-rate tariffs charge the consumer a fixed rate per kWh irrespective of the cost of the energy to the supplier.
- Switched load capability allows the tariff to be varied to reflect the lower cost to the supplier during the night when demand on the national grid is lower. There are three types of switched load tariff currently available:
- Economy 7 tariffs lower the rate for seven hours of the night but offset it with a higher rate during the day than for a fixed-rate tariff. The times for which the lower rate is given depends on the supplier but is usually from midnight to 7am.
- Economy 10 tariffs give a lower rate for ten hours of the day, typically split into the three periods of midday-3pm, 5pm-7pm and midnight-5am.
- Flexible tariffs vary the charge to the consumer in real-time, according to the cost to the supplier.

The u-value and the airtightness are assessed in the planMost customers use most energy during the day, which leads to much higher demand during the day reflected in a higher cost to the supplier. Economy 7 and Economy 10 tariffs may offer some savings to the owners of electric cars, which are usually charged overnight, or to people who work shifts at unusual hours. However, most people cannot shift much of their electricity usage to the night-time, which is why the night is a period of low demand in the first place.

The next generation of Atamate will be able to take full advantage of switched load tariffs so that a building's services and appliances can take advantage of lower tariffs wherever possible.

Onsite energy generation

In recent years, many buildings have become not only consumers of energy but also producers of it. Common approaches are:

- Photovoltaic cells are placed on a roof to generate electricity.
- Solar thermal panels placed on a roof to heat water.
- Solid fuel stoves, usually powered by wood, used for space and water heating.

In most cases, onsite generation produces cheaper energy than the mains but not enough of it to fully replace the mains. Atamate integrates various sources of data to ensure a building uses all the energy from onsite generation before buying any mains energy.

How it does that will depend on the type of onsite generation available. For example, it may use the weather forecast to predict how much energy a solar thermal panel will deliver during the day and balance that against the cost of electricity during the night, which it may assess in real-time if the building is supplied by a flexible tariff. Another approach might be to use the time at which a solid fuel burner is usually used to decide whether to switch the heating on.

A building's onsite generation systems may sometimes produce more electricity than the building needs so rather than letting it go to waste, it may be sold to offset the cost of installing the generation system in the first place. It is not currently possible to sell electricity to the national grid but it may be possible to set up connections that allow it to be sold to neighbours. Such peer-to-peer networks are already the basis of heat networks (see above) and the same principle could be applied to an electricity network.

Atamate could handle billing on a peer-to-peer electricity network could be managed using sub-meters in the same way as if the generator was reselling mains electricity to tenants (see above), according to a tariff that could be fixed or flexible according to whatever agreement was reached between the peers on the network.

Footnotes

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About Us

Atamate is a dynamic Oxford-based smart building software company started in 2007. We aim to reduce the environmental impact of buildings in the UK and around the world while reducing both capital and running costs of properties.

Collaborations with top-class universities such as Oxford University, Oxford Brookes, Loughborough as well as publishing academic papers with the Chartered Institute of Building Services Engineers (CIBSE) means that we are always on the cutting edge of our field.

Contact us

Please get in touch to see how Atamate can benefit your next project.

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