ENERGY AND CARBON
IN THE BUILT
ENVIRONMENT

Metering Technology eBook for Net Zero ESG & Sustainability





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Net Zero & ESG performance made simpler by technology

In this ebook and series of articles, Wattwatchers explores the challenges and opportunities building owners, managers and installers face with electricity metering for Net Zero and ESG performance (and out-performance). The first and second chapters of this free resource look at the challenges that arise with using old-style, increasingly outdated metering technologies, starting with installation and setup (Chapter 1), followed by operations and data (Chapter 2). Then we shift to the opportunities to do better with new technology choices (Chapter 3), with the final instalment providing a checklist for getting it right (Chapter 4).

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INTRODUCTION

To set the scene, electricity metering is crucial for sustainability frameworks including Green Star, which help achieve star ratings in new construction, and NABERS and GRESB that property owners participate in to enhance asset valuations. It also plays a vital role in delivering on mandatory requirements in the National Construction Code (NCC) Section J8/9.

Good-quality, readily-available electricity data can be a superpower in keeping building energy costs and carbon emissions down, while increasing property asset value and identifying issues that operations need to manage.

All of this can now be addressed with smart engineering, and by choosing the right technologies - including cost-effective metering that is ultra-compact, cable-free and cloud-connected. First, let's understand the problems that need to be overcome...



James Clements, Director of Net Zero Property, Wattwatchers Digital Energy

'Metering and monitoring is a central component of good facility management. It can help you manage energy use and costs, report on your energy performance, achieve regulatory compliance and operate your facility more effectively.'

- Fact Sheet: Electricity Metering and Monitoring. NSW Government

Chapter 1

Why building sustainability ratings matter and what to do about it

Today's property owners, facilities managers, and sustainability and energy professionals in the built environment space need to:

- Support progress to Net Zero with good quality data
- Drive asset-level implementation of ESG
- Accurately track energy, water and carbon metrics
- Drive and support tenant engagement

Sustainability ratings matter because they can impact the value of the building, and how attractive it is to tenants.

Electricity data is high-value in building ratings, especially to understand solar generation impact and tenant consumption, and to measure exclusion areas or different kinds of floor space.

Best-in-class solutions for electricity metering will support all of the above, and will automate data capture into platforms for calculating carbon emissions, reporting on sustainability, and making public disclosures that need to be accurate.

With rising costs of energy, tenants have higher expectations that impact on property managers and owners. As a result, leading property companies are upping their game in tenant engagement.

'With rising costs of energy, tenants have higher expectations that impact on property managers and owners. '

Getting great quality data to respond to these heightened expectations, and to support a growing array of requirements, is not easy and has some challenges.

This means that it is common for the right kind of data not to be readily available, and for the lack of good metering/monitoring and data capture to make often-onerous manual processes the only alternative.

There are many examples of this, but there's a couple of common ones worth discussing.

Scope 3 emissions

Getting tenant data is painful, and often results in 'burnt' relationships and low levels of compliance.

However, tenant consumption data is often required for sustainability ratings, with business parks and warehouse logistics being good examples of relevant asset classes where this applies. In large property companies, there can be a metaphorical village of people trying to obtain this information.

In Wattwatchers' experience, the manual approach can damage relationship equity and has much lower levels of compliance.

In addition, because it's manual, data collection is typically done annually for the reporting cycle, which misses an opportunity to use more timely data to support tenant engagement, or reduce emissions from a tenancy.



Timely information will help you manage the performance of assets and support pro-active tenant engagement. Typical traditional options, and challenges that come with them, are listed below:

Get bills from tenants - this means a lot of manual effort that can detract from the core relationship. Typically has inconsistent results resulting in low levels of compliance.Many tenants do not want to share cost information.Typically done infrequently, so the data is not useful for managing performance week to week.

Get interval data from the meter data agent - this requires permission from the tenant. Every time the tenant gets a new electricity retailer, you have to repeat the process. There is a cost to getting this data, usually charged per destination it's pushed to. Data is for yesterday, and only includes kWh and kVar, and misses valuable measurements like voltage. Data has limited value for supporting remote solar investigation.

Solar generation

PV systems may not be monitored, particularly if they've been around for a few years and have become like 'part of the furniture'.

Apart from having no metering or monitoring at all, it is not uncommon for there to be no communications onsite to get the monitoring data out, even though metering has been installed.



Solar systems tend to be rolled out progressively, and use a variety of equipment – such as inverters – that were competitively priced at the time of deployment.

Depending on inverter types and capabilities, there's often no way available to get data out, or to coordinate data from different types and generations of inverters and other equipment.

This in turn leads to higher data integration costs, which becomes more complex if you're operating in multiple jurisdictions or countries, potentially with a greater variety of inverter technologies to work with.

If you have an existing solar system that doesn't have communications, and you'd like to get data from it, you'll have to send someone to site to add WiFi capability or a cellular router, and configure the inverter (which you hopefully have the password for).

It's clunky, and you are unlikely to achieve the results you need. Indeed, by the time you've done this, often for disjointed data that lacks richness and accuracy, you've probably invested as much as it takes to fit a new high-performing metering/monitoring device.

The next article in this series (Article 2) looks at the operational and data downside of traditional electricity metering in the built environment.



‘When we think of commercial and industrial buildings, it’s the premium assets that dominate the mindshare, but in reality that’s only 20% of the global building stock. There are many building types not well served by traditional EMS systems because their building systems are fairly simple - while traditional metering solutions are overly complex, high cost and inflexible. Think of buildings like warehouses, business parks, school/university campus, mid-market office, big-box retail, regional shopping centres, distributed food and beverage retail chains, and buildings less than 5,000 square meters. This document is dedicated to the unloved and underserved buildings that represent the majority of assets.’

James Clements, Wattwatchers

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Chapter 2

Challenges of getting good outcomes from traditional energy metering

Like the old lubricants advertisement punchline that declared 'oils ain't oils', data from energy metering and monitoring can be variable too.
For a start, just because there is metering installed doesn't mean the data is correct.

For building sub-meters, if you're starting to look at the electricity data for the first time, you can almost be certain that there will be data quality issues that need to be resolved.

Once a meter in a traditional system has been commissioned there's usually limited ability to drill into the detail without going to site (which means yet another 'truck roll' and more costs)..

For instance if you suspect a meter has an incorrect reading, you typically will need to check that the meter has the correct Current Transformer (CT) settings, and that the CTs are the right way and phasing is correct.

For traditional systems, correcting data collection or confirming its accuracy almost always means a trip to the site, and then accessing the physical meter to scroll through meter data and settings.

It's hard to do quick remote checks, which means it only happens occasionally, such as when sites are designed to be managed remotely and have been maintained accordingly.

'For building sub-meters, if you're starting to look at the electricity data for the first time, you can almost be certain that there will be data quality issues that need to be resolved.'

Meter failure and often-related communications issues may also be present, and it's often hard to tell until you start examining the meter data.

In traditional systems, even where someone has been receiving alerts or notifications remotely, it's highly likely that they are getting smashed by too many alerts, and have started to ignore them. There's even a 'condition' documented for this, called 'alarm fatigue'.

Making use of your existing electricity data sounds like a good idea, right? But getting data from existing building systems is not as easy as it sounds.

If you're in an A-grade premium office asset where you have sophisticated systems, and some budget to go with it, you probably can make this happen. Unfortunately, however, there's plenty of assets where it's hard to make a proposition stack up, including: mid-market office, schools, warehouses, business parks, solar systems, and distributed retail. If you're doing work across a portfolio, where each building has a different system, then trying to do this can quickly become a complex, costly and slow process.

BMS or EMS?

It's likely that your metering will be connected to a BMS or EMS. These systems are NOT known for their interoperability, and it's unlikely that you or your team will have the know-how and the site access to get a feed from the system.



So your first port of call will be the manufacturer. Then you'll work through a process to understand what meter types are connected, and what metering points they are covering.

From there, you'll need to engage someone who is qualified to create an automated schedule to send the data somewhere. This process typically takes months, costs a considerable amount for the professional services required, and in some cases may require hardware additions and software upgrades.

Ideally, all of your metering will be connected, but there are plenty of sites where there is a physical meter that does not have a 'point' in the BMS system. You then need to add it, which involves professional services, and potentially an upgrade in licensing to accommodate more points.

The actual costs of running metering through BMS and EMS systems are difficult to understand because they're broken up, typically across: service contracts, capital purchases, project costs, certificate renewals and licence agreements. By contrast, software-as-a-service (SaaS) agreements can actually be far more transparent.

Data 'convenience'

Frequently, to maximise its value and achieve performance and compliance objectives, data will need to be shareable across multiple and different stakeholders.



To be technically viable and cost effective, such data sharing needs to be convenient.

If you're driving ESG into asset management, you'll have a busy agenda: rolling out renewables, doing efficiency upgrades on buildings, separating common-area and tenant loads, rating buildings, tracking progress and making disclosures to the public or investors.

All of this menu for action requires effort, from the operations frontline through to corporate HQ oversight.
In property, multiple stakeholders are involved, each wanting different views, and often working in different platforms across all of the relevant players: facility managers, building managers, tenants, sustainability managers and more.

Having a standard way to monitor electricity everywhere helps to make your investment go further, making the most use of software scalability, and getting data into forms that support decision-making by each of the different stakeholders.

Having good data for electricity plays a valuable role in validating multiple outcomes: the performance of solar, measuring the impact of efficiency projects, monitoring vehicle charging, and supporting disclosures to boards, financial markets and the public.

Real-time apps

Data to support tenant engagement is becoming more important in property strategies.



Real-time data is valuable to support feedback to tenants in mobile applications or onsite displays.

Increasingly, facilities managers are stretched across multiple buildings, and most individual buildings don't have permanent facility management teams onsite (that's a luxury for premium building stock).

Something as simple as showing solar generation and building energy usage can not only support cultural change, but also can reduce the time to resolve technical issues.

Let's say a solar system trips, or is not restored after onsite works, then real-time app displays can provide necessary feedback to the people onsite, so they can raise a support issue, and have the solar fixed in a timely fashion. Ideally, software analytics would notify the solar contractor directly, but not all solar systems have sophisticated services attached.

Rolling up portfolios

Traditional systems tend to involve significant upgrades or technology additions on-premise to roll-up data across portfolios. Costs can mount up quickly for items including BMS/EMS head-ends, BACnet gateway implementation, the addition of hardware gateways of various types, and the time (and expense) of-highly trained people to understand and configure it all.

Keeping things simple can help your investment to provide more value.



It would be great if you could get all of the data you need from the heavily-regulated energy system itself.

But often the only thing you can be guaranteed to receive consistently is your bill.
Even trying to get billing data in some form that is convenient for software, like a spreadsheet, is difficult at best. There's no established standard format, and the availability of this option depends on your size as a customer, and the services your retailer delivers.

For utility billing meter data, by contrast to your own sub-metering, you can generally get it a day late at 30-minute intervals, if you pay for the privilege. However, the data is not very granular, it's not in real or near real-time to drive timely visibility, and it's missing valuable data points, like voltage which plays a significant role in solar.

The next chapter looks at key issues for solution buyers in sourcing best-in-class new technologies for energy metering and monitoring.



Chapter 3

Traditional metering options aren't all equal and neither are IoT technologies

Done well, modern wireless IoT technologies can simplify electricity monitoring, lower costs and make data much more usable and valuable.

Buyer beware, however, because the reality is that not all IoT technologies have great data quality, with many plagued by data gaps, unreliable communications and the need to set-up device management systems.

So, make sure you understand what you need before you buy, and choose carefully. Best-in-class technology will have data quality front-of-mind, and will incorporate 'smart design' to simplify the deployment of electricity metering in new-build and retrofit. It helps to have the in-built flexibility to both meet basic compliance, such as for NCC Section J8/9 requirements, while also enabling beyond-compliance upgrades to Green Star performance levels and similar sustainability requirements.

Underlying core requirements should include:

- Real-time and historic dashboards to manage electricity (and water and carbon) with target tracking
- Rapid roll-out: no communications cabling and conduit required

(*List continues on next page)*

'Best-in-class technology will have data quality front-of-mind, and will incorporate 'smart design' to simplify the deployment of electricity metering in new-build and retrofit.'

- Lower-cost through use of more flexible solutions
- Push reports to tenants and other stakeholders
- Analytics that detect site issues and opportunities. Prioritised notifications, so you know where to focus
- Future-proof SaaS (with cloud-based, integrated real-time data, and AI + IoT platform technology that makes sure you always have the latest version)
- Complete interoperability – established data connections to common portfolio reporting platforms used in property (avoid legacy integration issues).
- No onsite computers, saving on space and cost, and delivering greater performance

Leading property companies are looking for ways to do more for their tenants in energy.

A mobile app designed for non-technical users will help, and should enable users to see site load and solar generation (where relevant) in real-time, and to examine historical periods and trends with ease.

If users are motivated to manage energy, they should be able to set a budget and track against it day-to-day, and be alerted if they go off-track, rather than have to wait for a month to find out from their next power bill.

Best-in-class solutions will make data available via an Applications Programming Interface (API) in real-time for use in the platforms in your business use cases.



This allows connections to be established into portfolio sustainability reporting and building performance analytics leaders.

Once data feeds are established, the data flows automatically, thus eliminating the need for manual effort to get complete and accurate data.

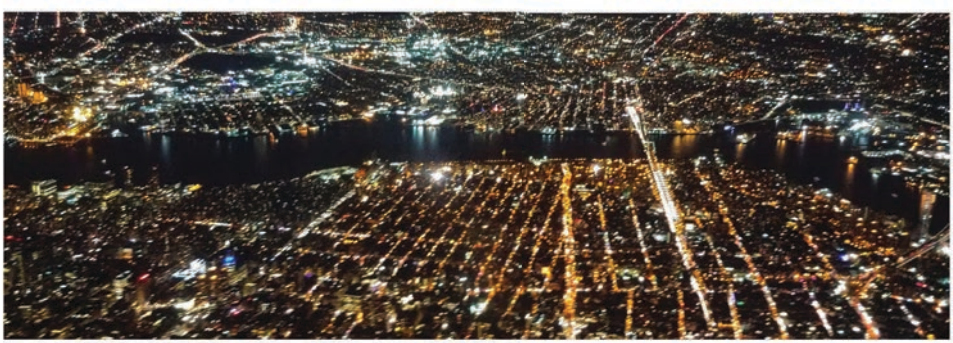
It doesn't matter which site or country the device is located in – data is accessed in the same way by API – enabling users to make the most of software scalability.

For energy data-of-record purposes, monitoring should be 'Class 1' (+/-1% accurate), which is the same as a utility meter.
To be timely, as well as accurate, metering needs reliable connectivity with the Cloud.

Best-in-class technology solutions will use 4G cellular, ideally with built-in choice of signals by using multi-carrier SIMs (devices will automatically select the best network for the location based on signal quality at the time, and can automatically switch to a different carrier if things change).

There are communications interruptions in the real-world, and cellular communications need to be handled accordingly.

This should include internal logging capacity within each metering/monitoring device, with automatic 'catch up' of device-held data with the Cloud server once any carrier signal outages are resolved.



At fleet management level, any devices that have gone offline should be visible immediately, so that appropriate action can be taken to remediate and maintain data quality.

Maximise investment value

Compact wireless solutions can be up to 70% less than traditional solutions, and can be commercially viable at small numbers of devices per site – for example when monitoring solar or tenant loads.

By combining functions into a single device, and eliminating the need for hubs, communications cables, conduits and all of the associated labour, best-in-class technology helps you get more data into the hands of your business for decision-making.

As an example, users may want to monitor any solar system, electric vehicle chargers or even individual efficiency upgrade projects so that they know exactly how they perform.

If users ever suspect the validity of data from a new-technology device, they can quickly perform some initial remote investigations from their desktops and examine phase-level detail, including seeing the CT settings applied.

CT settings can be cross-checked against original commissioning documents and installation photos to see if they are set correctly, or otherwise. This first sense-check happens from the comfort of a desk and can check off the most common issues for incorrect meter reads.



These 'common faults and fixes' include reversed CT's, incorrect phasing and the wrong CT size having been set, all of which can be fixed remotely with no costly truck rolls required. Best-in-class devices continually self check, and you'll be alerted to any issues.

With achieving the best outcomes firmly on the radar, the final chapter in this eBook explores what to focus on to get the Net Zero, ESG and sustainability performance you need.



Chapter 4

Accelerate your Net Zero journey with the right metering technology choices

Delivering on Net Zero, and being able to prove sustainability performance, are becoming increasingly important as its growing impact on both CapEx and OpEx, as well as asset and portfolio values, becomes increasingly clear to businesses.

It's important to start your journey with the insight that in many cases it's worth considering deploying a new technology, rather than remediating, and upgrading existing systems for energy monitoring.

Utilising the right technologies – that (a) avoid the complexity of working with legacy systems, and (b) are simple, cost-effective, accurate and flexible – will enable you to get better data, faster, and with less work. Traditional technologies can burn budgets quickly. Newer technologies can help you to measure more and estimate less, by being commercially viable at a smaller scale: for example, solar, electric vehicle (EV) chargers and efficiency projects.

Ensuing that you select a technology with great data quality is essential to ensuring that you have the data to make disclosures with confidence. Look for Class 1 (+/- 1%) accuracy on kWh, decentralised internal logging capacity for data by phase, communications smarts like multi-telco network support, and real-time tools to understand the status of devices.

'Traditional technologies can burn budgets quickly. Newer technologies can help you to measure more and estimate less, by being commercially viable at a smaller scale.'

To track your progress, you'll need to establish a baseline, which is not always a simple proposition.

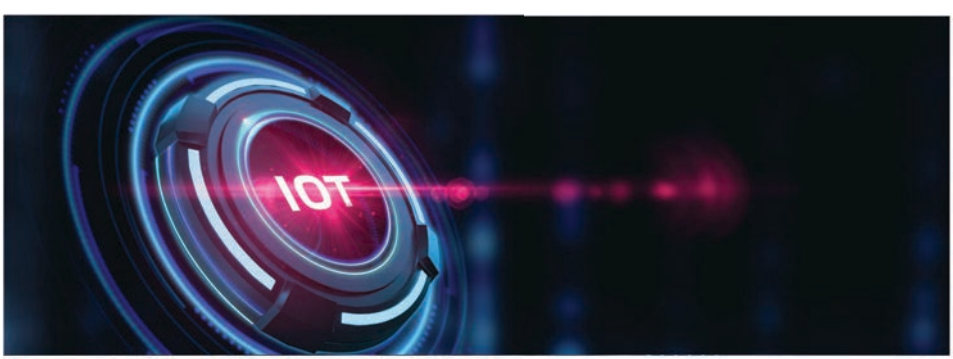
Take assets like industrial warehouse and logistics, or business parks, that have a large percentage of tenant loads. Or corporations occupying a lot of tenanted space in buildings. In both cases, getting the data for consumption and solar generation for tracking sustainability progress is likely to be a manual process.

A cost-effective IoT solution that can be deployed wirelessly is a good starting point to avoid manual processes. This means operating without reliance on local communications networks and hubs to access accurate and complete data, which reduces hardware and installation complexity, minimises cost, and removes potential failure points.

Scoping is simple because you can avoid the complexity and ambiguity of having to get into the nitty-gritty detail of legacy infrastructure.

With the right services contractor, roll-outs can happen swiftly. Once technologies are connected into a platform, the data can roll into your reporting system automatically, and manual processes are only required for exceptions.

Selecting a technology with a simple, repeatable installation process is essential to scalability. Showing the tenant value is key for success (see later section).



To track progress and make public disclosures you'll need to consolidate all of your sustainability data.

This typically means having your sustainability data rolled-up into a platform that automates many of the calculations and reports. This is a different kind of platform to a real-time onsite EMS. If you select the right monitoring technology, with API-access to all data, you're on the right path to ensuring data can be reliably ingested by a platform, and minimise manual exception handling work.

Operations teams have never been so important in keeping your Net Zero journey on track and driving ESG into each asset. For Net Zero, you'll be rating assets, investing in renewables, improving efficiency and electrifying everything.

Selecting a standard electricity monitoring technology with the flexibility to be used across many use cases, and platforms, will help keep you on track and ensure that your investments are delivering on expectations.

Flexibility is key

It's very likely that you'll be rating assets under various sustainability frameworks like Green Star, GRESB and NABERS, and using those as a way to track progress. The key to getting the most value is selecting one hardware technology that is commercially viable to use across typical uses including: tenant consumption, NABERS exclusion, different floor space type within buildings, and at the individual equipment level (solar for example).



Hardware needs the right software. Things to look for in an EMS include: KPI's you care about automatically calculated. Prioritised alerts. Flexible notification settings. Logic that looks for efficiencies. Software that enables you to easily 'drill down' into the detail of interval data. Regular reports also need to be proactively delivered to stakeholders, so that they can get value from the data without logging in.

Selected data often needs to be shared with portfolio reporting platforms, and a scalable way to do this is required.

Validating the value delivered by efficiency projects requires technology that is commercially viable to use at the project-level, such as a lighting circuit, chiller unit, refrigeration plant or other individual plant item. To achieve this you need cost-effective hardware, and a simple installation method to lower the cost delivered.

Once it's viable, you then need access to real-time data and status to run the numbers. You don't want to find out in a month that you're missing a bunch of data because a 'logger' was de-energised.

Independent data sources

Electricity data is valuable in determining if assets are performing as expected. Solar is a very good example of this, where inverter systems are not accurate enough to validate performance, and an independent, accurate source of measurement is a big advantage.



Can you answer questions like these with confidence: Is my solar system performing as we envisaged? Did that chiller upgrade deliver the results I expected?

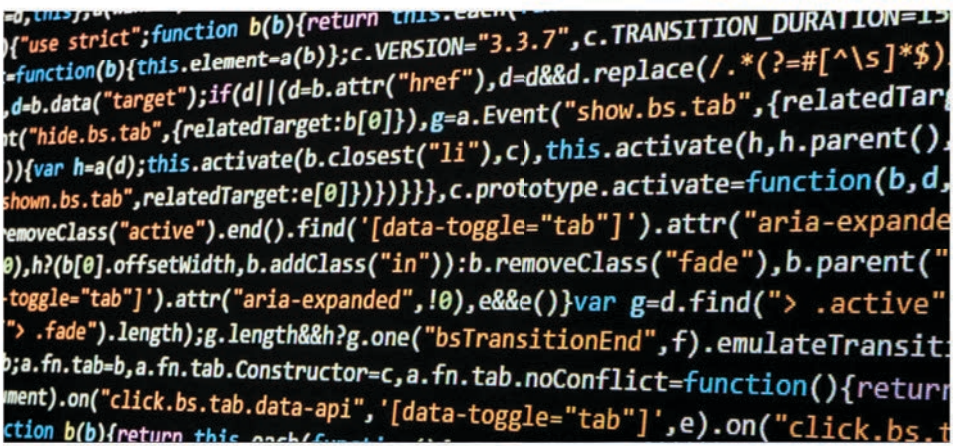
BREAKOUT: *Charter Hall, as an example, has used Wattwatchers technology to measure tenants' consumption in more than 263 buildings, and develop a baseline and participate in Green Star. Wattwatchers technology has contributed to getting ~90% of all industrial assets rated. Electricity baselines have been established and are the point of reference for improvements. Source: Calculated from Charter Hall 2023 sustainability databook*

Tenant engagement is a key focus for many leading property companies. Having happier, more engaged tenants is a great start to ensuring their ongoing participation in a building's sustainability journey.

Tenant-friendly systems

It's no surprise, therefore, that providing tenants with systems that they can use themselves and benefit from can be a strong positive influence.

Tenants are likely to have both technical and non-technical users. Traditional systems often cater for technical users with no regard for non-technical users who just want something simple.



We advise looking for three things to support better tenant engagement:

- Real-time mobile app for non-technical users that, as a base, allows tracking against a simple budget, and a real-time understanding of solar and load.
- The ability to share data without logging into the system either via push reports, or live pages that don't require login.
- The ability to publish live data to displays in the premises.
- Rich data that can support deeper technical engagement to evaluate solar feasibility, examine power quality and more.

You want to select technologies that give the best chance of the system being used by the many stakeholders involved in owning and operating today's buildings.

It's unlikely there's one system that is used by all stakeholders. So, in practice, this means having good off-the-shelf software options that deliver insights, and have the ability to share real-time data with other platforms that are used in businesses.

Find technologies that help to surface the insights that help you. Stakeholders need to know what to take action on, and not be slammed with non-prioritised alarms.



Web-enabled technologies, mobile functionality and cable-free wireless technologies not only make it more cost-effective to achieve or outperform sustainability targets, or meet code compliance, but can also enhance stakeholder access to data for decision-making.

Cancel the noise

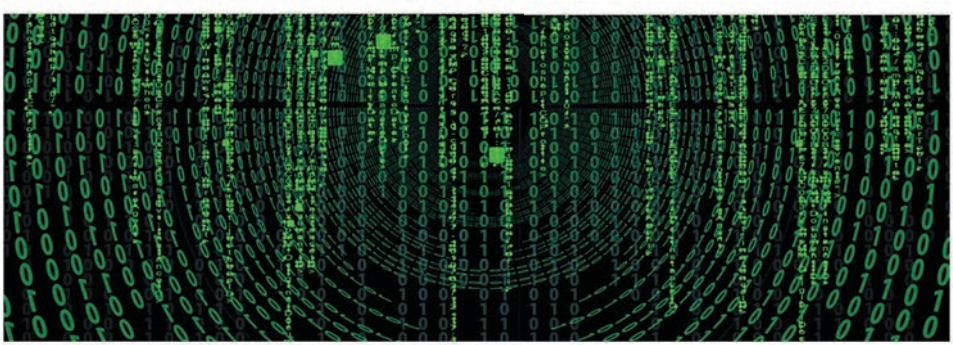
We all want to avoid systems that are 'noisy' and that cause 'alarm fatigue'. In new-build, choosing technologies that cost-effectively scale from basic code compliance to higher sustainability levels is important.

If you choose technologies that give more bang for the buck, you are setting up the path to deliver on higher levels of sustainability compliance.

Having a fast-to-deploy technology such as IoT and Cloud-based solutions, can open up new opportunities, including streamlining the retrofitting of a metering and EMS system to a building, where traditional systems are outrageously expensive.

Software development happens much faster than hardware development. Every year there are new players, new capabilities and different flavours of UI and analytics.

The best thing you can do to ensure your hardware is future-proofed is to make sure it's as interoperable as possible, and can be used with different software platforms. For real-time data, this cannot be CSV files, but a good API will give you the flexibility that you need.



If you change platforms, or introduce another platform that needs electricity data, ensure that you have the means to 'feed' the new platform the granularity and frequency of data it requires.

Here are some simple rules to follow that will help make the solution you choose more useable and cost-effective:

- Connecting electricity metering to your BMS is rarely the right choice. These platforms tend to be inflexible and lock you in, when you really want the opposite (i.e. flexibility).
- Find systems that give you great out-of-the-box software options, but play well with other software platforms.
- For ultimate flexibility, ensure that all data is accessible in a standard way, and definitely not a way that is bespoke for every site – because that will cost you in professional services and software integration costs
- When comparing technologies, look at the whole project cost for installation, commissioning and the Total Cost of Ownership (TCO).



Wattwatchers is Australia's leading technology platform helping households and businesses to be energy efficient, maximise renewables, achieve net zero, and electrify.

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