# The power of data: using WTW's Renewable Energy Loss Database

## Introduction

*"The goal is to turn data into information, and information into insight." — Carly Fiorina, ex CEO of Hewlett-Packard*

In a world of information overload, there is a real need and requirement to be able to base clear and concise decision making on accurate and relevant data.

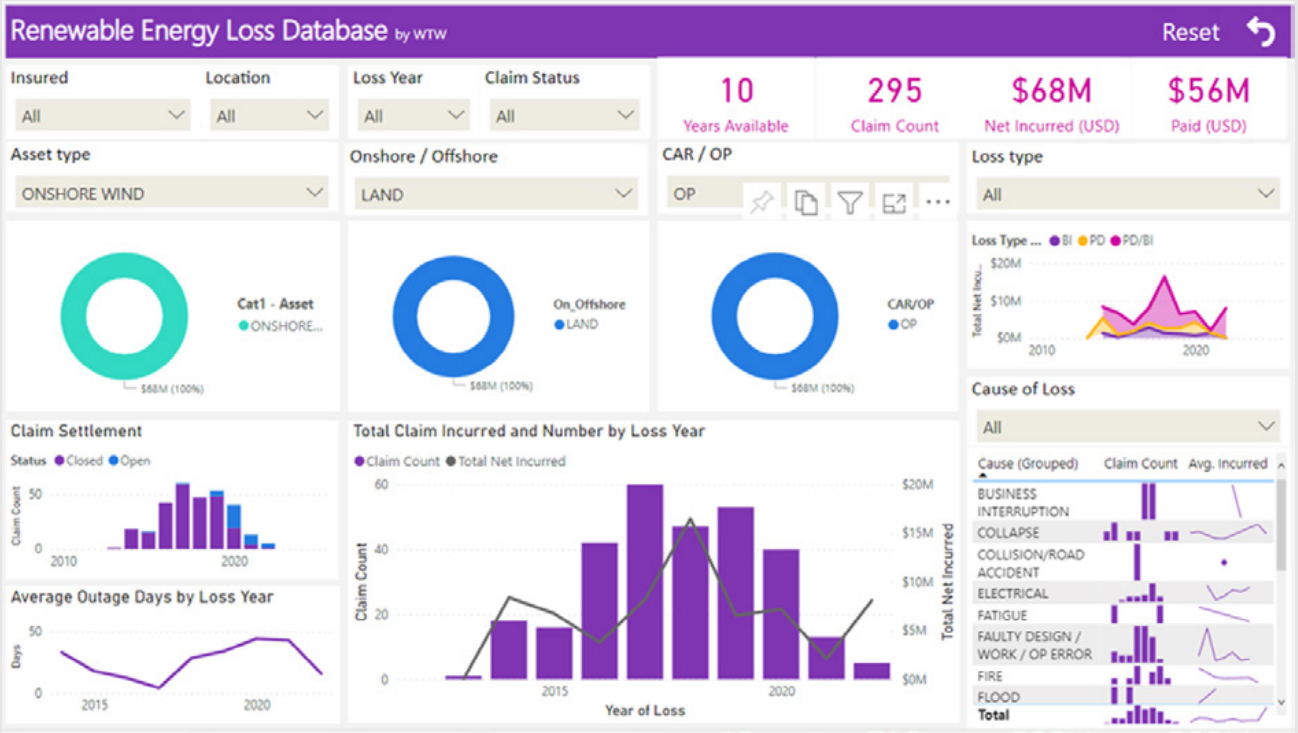
It is too easy to read reviews, check social media platforms and rely on hearsay to influence decision making processes; while this is not certainly all bad, there remains an ongoing realisation that "real" data remains one of the main drivers of business growth and development. From an insurance perspective, how does relevant data influence the buyer and the seller in the transactional process?

The renewable energy industry continues to grow at a staggering rate, as countries remain committed to delivering on their environmental promises. Risk profile and risk engineering processes provide clear and demonstrable data on which to make key business decisions, but there also remains a strong emphasis on loss trends and loss ratios when assessing and profiling a risk.

### The value of claims data

Accurate and detailed claims data can provide not only a snapshot of frequency of losses, but also where, how, and why losses occur. This claims data can then be used as a key tool to help structure insurance programmes and provide meaningful insights to EML studies.

Figure 1: **Operational wind turbine losses, 2012-22 (global view, illustrative purposes only)**




Source: WTW Renewable Energy Loss Database (RELD)

For example, Figure 1 above shows operational wind turbine losses extracted from the WTW Renewable Energy Loss Database (RELD) and provides a snapshot of the scale of onshore wind losses across the insurance marketplace.

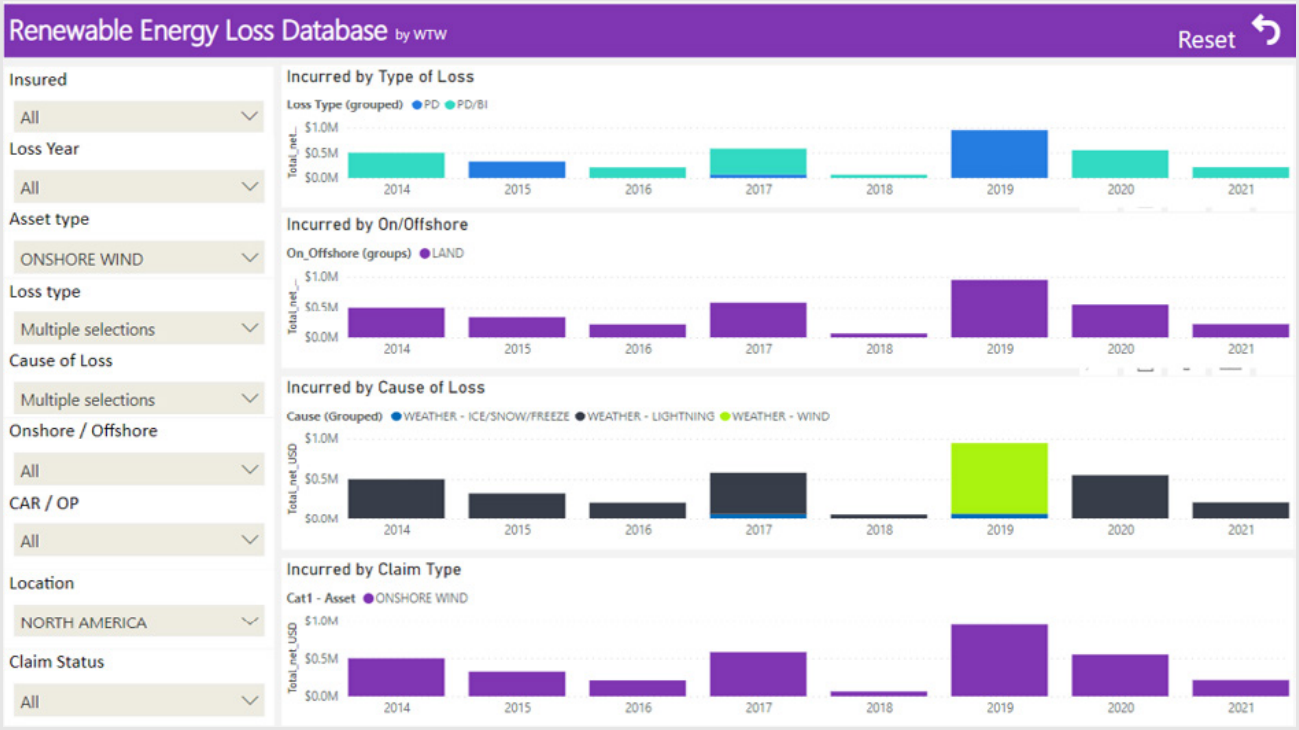
What it begins to identify are some highly informative insights into causation trends, as well as indications of downtime or outage following an insured incident. If we were to examine these claims further, we may in fact be able to identify additional contributing factors such as supply chain delays and availability of spares. Having the ability to analyse this type of data can help the business in planning for such events.

## Risk mitigation

Detailed data obtained through the claims investigation and adjustment process enhances risk mitigation considerations – understanding causes of loss, implementation and/or upgrading of lightning protection systems or improving the logistical management of spare parts and consumables. Conversely, insurers may look at similar data and loss trends to determine deductible levels or to apply more restrictive cover or warranties within insurance programmes.

Similarly, identifying onshore wind losses by cause gives the ability to evaluate loss trends -irrespective of technologies. This is of particular interest when looking at Nat Cat or weather-related causes where it can be seen that, based on WTW's experience, lightning remains the dominant cause of losses in North America as per Figure 2 overleaf.

Figure 2: **Onshore wind losses by cause of loss, 2014-21 (North America view, illustrative purposes only)**



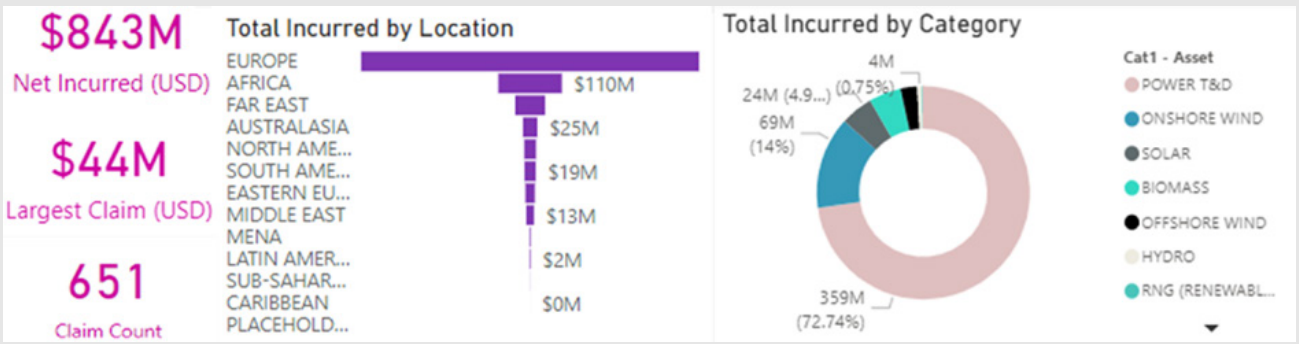

Source: WTW Renewable Energy Loss Database (RELD)

## Using RELD in risk optimisation

As we have seen, RELD collates and brings impressive clarity to over US$800 million of PD/BI loss data from across the industry over the last thirteen years. A further extract from RELD is shown in Figure 3 below. The US$800 million figure includes at least US$34 million worth of fires in solar farms, US$37 million of broken wind turbines and over US$500 million of problems with power transmission and distribution.

Claims such as those outlined by RELD are unavoidable, but it's possible to control the impact they have on a business. By making informed decisions about limits and deductibles, companies can ensure that they have adequate cover and, at the same time, avoid ceding too much money to insurers.

Figure 3: **Renewable Energy Loss summary, 2012-22 (illustrative purposes only)**




Source: WTW Renewable Energy Loss Database (RELD)

## The Risk Optimisation process

Through a process called Risk Optimisation, companies can make better decisions as to their risk retention and insurance strategy. The optimisation process, or the 'analytical journey', is best understood in three sequential steps: Describe, Predict and Optimise.

Progression through these steps represents increasingly valuable opportunities and decisions for clients to take. While Describe involves comparatively surface-level benchmarking and analytics based on past claims data, Optimise is deep decision-making process, based on a detailed analysis of the risks to which a company is exposed. The intermediary step, Predict, follows extensive risk modelling and is an opportunity for companies to re-evaluate tactics with regards to their current insurance strategy.

## Risk Optimization case study

For illustrative purposes, consider an entirely hypothetical company, ABC Geothermal (ABC). ABC have regularly invested in their risk management function, and they've incurred a loss every other year for the last ten years. While many of these losses have been attritional, some have been rather large. As a fledgling start-up, opting to insure the full value of their assets and aiming for the lowest possible deductible was a great strategy. However, as the company matures, questions are being asked as to whether this is the wisest strategy going forward.

It's possible that, over this period, ABC's insurance structure has become sub-optimal; recognising this, ABC sets out on their analytical journey. Recall that the first step of the journey involves describing a company's current situation via benchmarks and basic analytics. ABC might pose themselves questions such as:

1. How much has the company paid in the past and claimed back?
2. How much does an insurance programme (such as the company's peers' programmes) cost?
3. What level of insurance cover are similar companies buying?

Questions like these are reactive, and often asked in response to large claims or bad loss years. Answers to these questions will provide ABC with a first indication of the need for deeper analysis.

## Looking into the future

Having determined the scope of their analytical journey, ABC decides to move on to the second step. Working with the brokers, actuaries make use of historical data to predict how the coming years could look under the current insurance strategy. Figure 4 to the right gives ABC an indication of their losses in typical, bad and catastrophic years. Rare events such as those highlighted below are more frequent than most people imagine - it's all to do with perspective. Take the lottery as an example; the chances of winning are incredibly low, but there's still a winner every other week! A highly unlikely event will happen, given enough chances or a long enough period of time.

Figure 4: **Predictive forecasts in typical, bad and catastrophic years (illustrative purposes only)**

*Amount in $ million*

| Return Period (Years) | Percentile | Gross Losses |
|---|---|---|
| 1 in 2 | 50.0% | 5.5 |
| 1 in 5 | 80.0% | 12.0 |
| 1 in 10 | 90.0% | 19.1 |
| 1 in 20 | 95.0% | 32.1 |
| 1 in 100 | 99.0% | 125.8 |
| 1 in 200 | 99.5% | 218.9 |
| 1 in 1000 | 99.9% | 747.3 |
| | Mean | 11.9 |
| | Std Dev | 40.4 |

Source: WTW

Due to the global nature of insurance, something somewhere is guaranteed to go seriously wrong every year. So, what does this mean for ABC, given the renewable energy industry's diversified nature, with hundreds of players spread across the globe?

A '1-in-200' event can be thought of as the sort of catastrophe that is seen on the news (i.e. not directly affecting the viewer) every other year or so, involving maybe a widespread forest fire or a bad hurricane. Highlighted in green in Figure 4 above are the projected losses if such an event were to impact ABC. If this is compared to the 1-in-1000 chance loss, the worst-case scenario, such a loss is vanishingly rare - as likely to occur as a "generation-defining event" such as Chernobyl or COVID-19.

## Leveraging the insights

Knowing what their organisation's specific odds are, ABC can leverage these insights to make sure their risk transfer is appropriate, maximising the value they get from it and protecting the company from external shocks. They will know whether they ought to lower their retention, whether they can lower their limit, how likely they are to exceed it and, ultimately, whether or not they're paying too much for their current policy.

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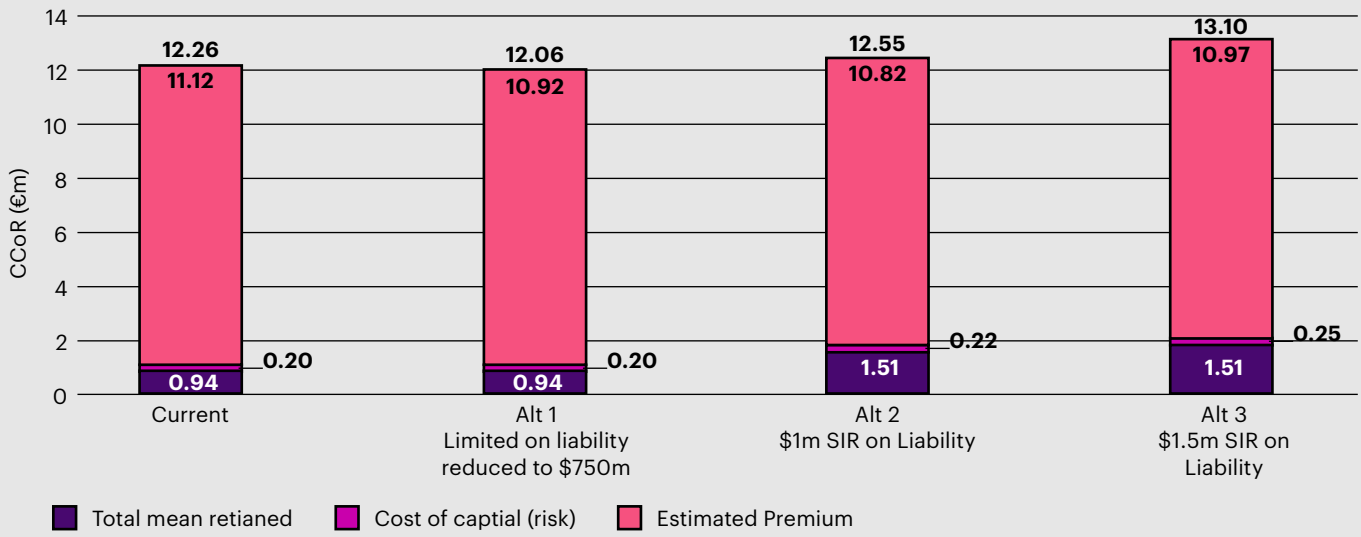
Figure 5: **leveraging the insights by comparing overall costs of risk (illustrative purposes only)**




Source: WTW

## The "Efficient Frontier"

Finally, we come to optimisation: maximising the gain across ABC's risk portfolio. Here, we can take advantage of the insurance market's slightly disjointed nature; the cost of risk is variable from one line of business to the next, which leaves scope for arbitrage. If a company is willing to look at their portfolio in a holistic way, then they can take on risk where it's expensive and give it up where it's cheap.

A risk optimisation piece can be conducted across all lines of business. The approach at WTW, for example, is via the Connected Risk Intelligence tool. In broad terms, CRI plots up-to-date insurance strategies across industries.

An example graph is showcased in Figure 6 below, with the cost of the strategy along the horizontal axis and the remaining risk along the vertical. Ideally, ABC wants to move from deep within the data cloud to take their place on the so-called 'Efficient Frontier', highlighted in green. Portfolios on the frontier are optimal in that they offer the best possible cost-to-risk ratio. Increasingly, risk intermediaries are successfully pushing clients in the wider Natural Resources industry towards it, enabling significant reductions in cost of risk.

Figure 6: **establishing the Efficient Frontier (illustrative purposes only)**


Source: WTW

## Using RELD in analysing inverter losses

### Preventing inverter claims

An inverter is one of the most important electrical components in a renewable power generation plant, converting the raw electricity generated from the system from DC (Direct Current) to AC (Alternating Current). This enables an efficient transmission and distribution flow through the electrical grid system to the end consumer use.

So what are the common problems that arise from inverters? Through our claims incident Type and Frequency tracking for our claims in the Renewable Energy industry, we have experienced a noticeable increase in the frequency of loss incidents involving inverters, which has been corroborated by our discussions with Renewable Energy loss adjusters and insurers. There is a general consensus that the number of incidents appear to have increased over the last few years; but given that this is essentially a basic, commonly used piece of equipment for all wind and solar renewable energy installations, why is this happening and how can future losses be prevented?

The key areas of focus are:

- Common issues
- The use of RELD
- Prevention techniques

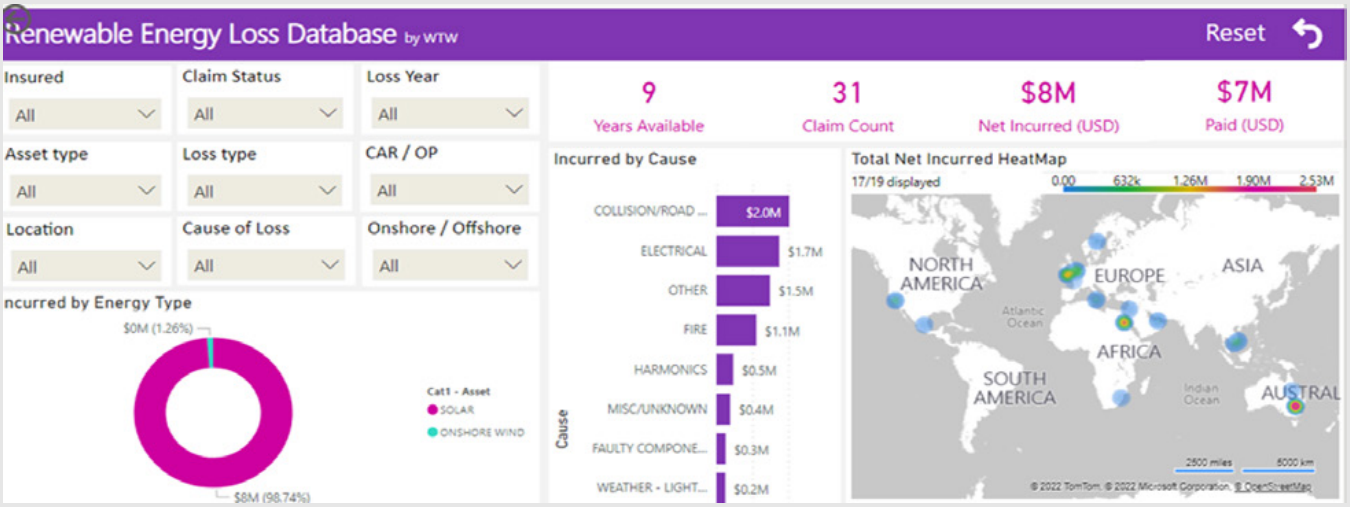
### Common inverter issues

The most frequent and well recorded issues which appear to be causing claim incidents for inverters relates to fires. The foremost and most likely reason for this is faulty and defective original components, or component degradation and breakdown within a few years of installation which then short circuits the electrical system, inducing a fire which consumes the inverter unit and potentially its surrounding property. IGBTs (insulated-gate bipolar transistors) are the dominant concern when it comes to components; these are the core power modules that ensures that the voltage is switched from AC to DC. Within the inverter there is a bank of these IGBTs and they are considered the functioning 'heart' of the inverter system. This means that when this component fails, there needs to be significant mitigation techniques to be applied.

Another key concern is that of workmanship error. While the individual components may have their own performance problems, the competence of the individual who assembled the inverter is equally important. Inverters are assembled and constructed in full form when shipped to the consumer, meaning that the inverters should leave the manufacturer's factory as complete and closed units. On arrival as the construction site, the inverter unit only needs to be physically installed with the switchgear, then tested & commissioned into the facility.

This installation is always performed by qualified electricians - frequently by the inverter manufacturer's own workforce - as it is accepted that any defective workmanship can cause electrical arcing, which will result in a fire. The installation of any inverter unit(s) will come with a detailed installation handbook, making it easy for any qualified electrician to install. The responsible lead electrician may be communicating to his team with varying experience or different languages; even a minor deviation to the installation guidelines, such as errors in nuts being over or under tightened, or the correct level of slack not being followed, would go against O&M advice. This signifies the importance of ensuring that appropriate and competent personnel are hired to fit their equipment. If possible, companies should ensure that the inverter unit manufacturer is overseeing all elements of installation and testing.

Figure 7: **WTW inverter losses, 2012-22**




Source: WTW

## Using RELD

So how can RELD data be utilised in a focused way for our clients in managing their inverter risk? Figure 7 above shows all WTW's recorded claims for inverters, which total US$8 million, 98% of which emanate from solar assets.

When the data is interrogated and discussed further with our in-house Renewable Energy Risk Engineers, it becomes clear that one reason for failure incidents is that solar assets are being placed into areas where the climate is hot, causing the inverters to overheat. Furthermore, a number of incidents extracted from our database involved a faulty thermostat that may have caused the inverter to overheat. Additionally, the opening and closing mechanism on the ventilation shafts were found to be getting clogged with dirt and grease, causing them to not function properly. This prompted us to discuss with our clients the extension of the inverter O&M process to include the inspection of thermostats and regular cleaning of the mechanical ventilation. This would create a simple, inexpensive solution to total loss by overheating and fire, with the associated downtime of a long-lead item. Out of the 23 claims we have logged, 11 of them have caused, or been caused by, a fire within the inverter. As can be seen in Figure 7 above, Australia has the greatest frequency, which aligns with market sentiment.

## Fire prevention approach

Referring back to mitigation techniques, a fire prevention approach must be considered by companies to avoid increased damage to the assets where fire propagation may occur. This can turn a relatively small claim into a complex one, caused by a domino effect through stacking inverters together in a single electrical switch room. This leads on to why automatic fire suppression is so crucial, as not only does it quickly detect and suppress fires, but it also has the ability to trip the inverter offline before the fire can spread to the balance of the assets.

Contractors also need to take additional measures to combat fire, particularly within solar parks where the best fire mitigation results from an early detection and speed of response. Because of the shortage of reliable data, the solar industry potentially underestimates the risk of fire to and from both the inverter and the solar farm as a whole. However, with the introduction of RELD we believe this data gap can now be closed and the risks for both buyers and insurers minimised.

## Conclusion: the value of data

Ultimately, having access to clear and concise claims data can help to influence business decisions around technology, suppliers, and design. It can also help shape the discussions around the structure of insurance programmes, the level of cover and the ability to challenge terms offered by insurers.

Of course, it is well understood that for any meaningful statistical output, the key driver has to be accurate input, based on determined parameters. For example, in RELD collating financials net of deductibles gives a more accurate picture when assessing loss ratios; identifying premium spend compared to incurred losses or categorising causes helps to identify trends.

However, perhaps just as importantly, access to and availability of detailed claims data allows a buyer to look beyond their own experience into the wider industry sector and see the bigger picture. To paraphrase the American statistician W. Edwards Deming, it is generally recognised that the ultimate purpose of collecting the data is to provide a basis for action or a recommendation.

Collection and collation of data is therefore just the start of a process – a process that ultimately can shape insights, strategies and decisions.

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