

**Delivering Operational Excellence through an Integrated Health and Safety Approach –
Nirvana or Necessity?**

Jason Franklin¹, Graeme Webby¹, Michael Boyle²

¹ PowerNet, Invercargill New Zealand

² Risk Mentor Pty Ltd, Brisbane Australia

*Presented at EEA Conference & Exhibition 2019,
25 - 27 June in Auckland
by Jason Franklin and Michael Boyle*

17 May 2019

Delivering Operational Excellence through an Integrated Health and Safety Approach – Nirvana or Necessity?

Jason Franklin¹, Graeme Webby¹, Michael Boyle²

¹ PowerNet, Invercargill New Zealand

² Risk Mentor Pty Ltd, Brisbane Australia

Abstract

PowerNet provides electricity distribution services for the lower part of the South Island of New Zealand. Its workforce typically operates in small teams in a hazardous industry where the actions of people determine the reliability of many controls.

In 2016, senior company leaders confirmed a strategic opportunity to use the Control Framework (CFw) approach to better connect and align operating processes, safety systems and leadership capability with how work is planned and executed. The PowerNet CFw approach is based on FMEA and human factors and followed this sequence:

1. Based on real world work cycles, confirm the relatively few required operating states that ensure efficient and safe production e.g. *Working at height - safe and productive work is routinely completed above the ground.*
2. Working with experienced and knowledgeable employees identify and confirm the credible failure modes that can compromise the required operating states e.g. *Pole fails with line mechanic attached to pole*
3. Identify the business inputs that prevent or mitigate the credible failure modes that can compromise the required operating states and validate these with the workforce e.g. *Pre-climb pole test procedure, worker competency specification, asset inspection regime*
4. Ensure that these inputs are maintained and integrated into normal operations e.g. *Field audits, competency assessments*

A team of experienced field operations employees carried out the initial patterning of this operational knowledge and this was followed by a validation process where all field team members were invited to review the output and consider “*if I am the person who can be harmed, is this control something that will always stop me being harmed?*”

There were challenges and costs from undertaking this strategic and practical work, but it is delivering multiple company benefits such as: high levels of employee engagement, improved supervisor support, routine monitoring of specific task controls, systematic verification that business inputs (control supports) are adequately designed and can be implemented and monitored, a decluttering of undue health and safety and associated bureaucracy, effective governance and reporting through to senior manager and Board level, transparent legislative compliance, and an increase in business analytical capability.

End user suitable outputs from this work, along with active links to other business systems and resources (internal and external) are now available to PowerNet personnel via a cloud-based platform. Importantly, this platform also actively uploads task related forms, photographs and other information to confirm that known operational controls are deployed and are being maintained.

While the initial drivers were to improve health and safety performance, the approach is delivering boarder strategic benefits to PowerNet.

Introduction

Formed in 1994, PowerNet is an electricity network management company, owned jointly by The Power Company Ltd and Electricity Invercargill Ltd. It is Invercargill based, with an office in Balclutha and depots at Lumsden, Te Anau, Gore, Palmerston, Ranfurly, Frankton, Balclutha and on Stewart Island. PowerNet manages networks that supply electricity to 70,000 customers, comprising - 14,095kms of lines and cables, 160,000 poles, 73 Zone substations and 15,917 transformers.

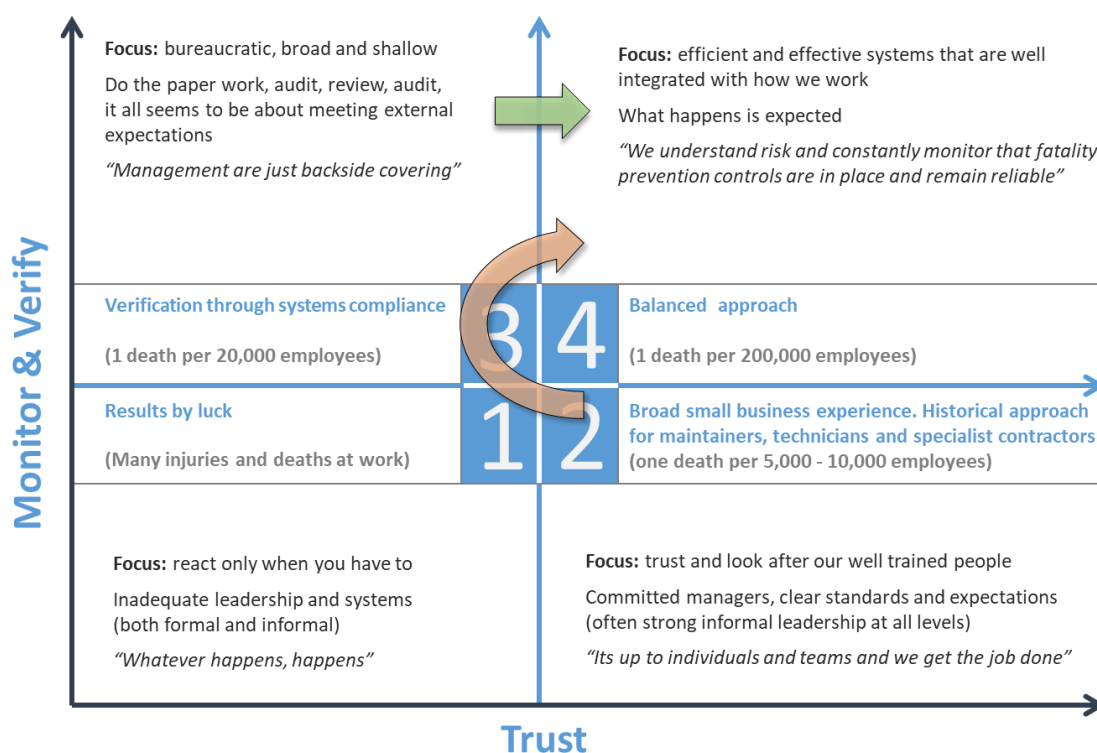
Field staff make up most of its direct workforce of 264 people and they operate in small teams across the network carrying out maintenance and construction tasks. These range from; on road and off-road driving, working with and around electricity, working above the ground, lifting and shifting loads, working alongside mobile equipment & machinery, traffic management, work in confined and restricted spaces and occasional helicopter and explosives work. Workplace injuries and fatalities while carrying out similar work continue to occur in the New Zealand power distribution and other industry sectors.

In mid-2016, PowerNet senior managers commissioned an external review of current business approaches for managing health and safety to identify improvement opportunities. The drivers for this review included; a commitment to improve company performance, a belief that successful approaches used in other industry sectors were relevant (informed by CEO and Company Director experience), a leadership intent to better integrate health and safety with operations and the recent commencement of the New Zealand Health and Safety at Work Act.

External Review Process

The comprehensive review involved ten consultant days of interviews, briefings, attendance at meetings, document reviews, observations at work sites and a structured discussion of preliminary findings with a cross section of employees based on the model below.

Figure 1 - The Balance Opportunity – Trust and Verify Quadrant Model



There was a group consensus on these discussion points:

- *Historically, well trained line mechanics and technicians were trusted to apply controls (quadrant 2 - high trust low monitoring & verification)*
- *It is accepted that through changes in how people are trained, injury experience and legislation mean that remaining in quadrant 2 is no longer an option*
- *There is concern that the organisation is currently operating or moving to operate in quadrant 3 – eroding trust through a bureaucratic focus on collecting evidence*
- *All personnel understood and agreed that developing and adapting approaches that can move PowerNet to work in the quadrant 4 is the best outcome for the business*

External Review Observations

The review report recorded these observations.

Systems are sound but incidents are still happening - evidenced by recent external audit results, the PowerNet health and safety system is sound and the organisation is understood to be operating at an injury performance level equivalent or better than its industry peers. However, significant incidents, in industry expected patterns, still occur from time-to-time and are of considerable concern to senior leaders and the Board.

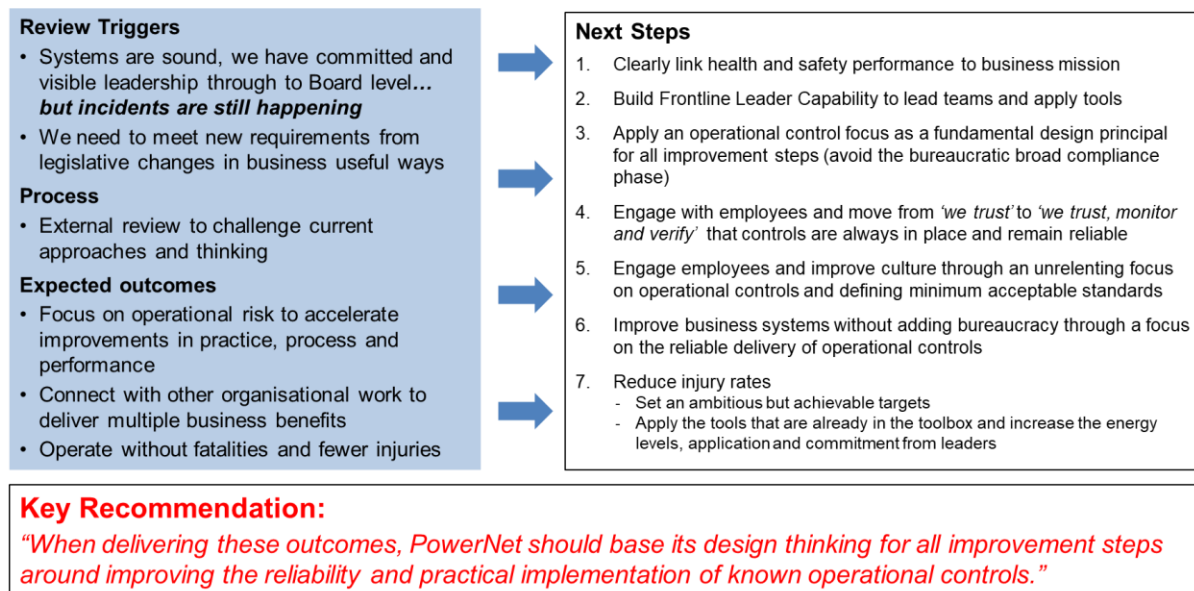
External changes and unnecessary bureaucracy - in April 2016, the New Zealand Health and Safety at Work Act came into force following a 2013 review that reported that the country's work health and safety system was failing. This new legislation is appropriately influencing how PowerNet health and safety personnel are currently modifying company approaches. In common with many industries PowerNet is taking steps to formalise existing processes and this includes requiring individuals and workgroups to record that they have identified hazards, assessed risks and intend to apply known controls e.g. through records of tailgate meetings. While the intent of this approach is admirable, without careful tailored integration into how work is carried out at PowerNet, it will introduce unnecessary bureaucracy and consume resources without improving operational health and safety practice and performance.

The industry challenge is to keep people controls (acts) reliable - in the electricity distribution industry the consequence for control failure can be serious injury or death and this is reflected in how personnel are trained and supervised. Workplace hazards and their controls are well known, however, some controls are entirely dependent on trusting people to apply them e.g. *use of portable earths, dig-checking poles, deploying traffic management controls* and in some circumstances their application is neither easily monitored nor verified e.g. when line mechanics work alone diagnosing faults on network equipment.

External Review Recommendations

The review recommended that PowerNet should base its design thinking for all improvement steps around increasing the reliability of known operational controls. This principle and the associated challenges, actions and goals identified by the review are illustrated in Figure 2 and detailed below. PowerNet accepted the review findings and recommendations and these became the basis for applying the Control Framework approach described in this paper.

Figure 2 – External Review, process with planning next steps



"The review intent is to assist a good organisation to get better by challenging current approaches and thinking. The starting position for this external review is that PowerNet can immediately accelerate improvements in health and safety practice, process and performance while delivering multiple business benefits such as:

1. Operating without fatalities or serious injuries (workforce or community) by reliably and efficiently controlling workplace hazards beyond current industry norms
2. Moving the organisation from a culture of *trust* to *trust, monitor and verify*
3. Delivering the business mission of Safe, Efficient and Reliable Power to Communities through linking and integrating health and safety processes with broader business improvements and with how operational work is really done
4. Providing role clarity for team leaders, supervisors and other line managers
5. Enlisting the practical and broad support of employees
6. Reducing medical treatment and lost time injuries

This approach will minimise compliance bureaucracy, provide role clarity, link to work processes, engage employees, ensure that documents and systems are fit for purpose, improve assurance processes while delivering industry leading performance.

The following simple questions frame the outcomes that this approach will deliver i.e. it will be successful when all employees can comprehensively answer all these questions.

For all employees:

1. *As I carry out my work, what are the hazards that can kill me or others?*
2. *What are the controls that stop this happening?*
3. *What is my role in ensuring and demonstrating that these controls are in place and remain reliable?*
4. *What will I do if I think the controls might not work?*

And for supervisors and other line managers

5. *How do I monitor and verify that controls (especially those dependent on the actions of people) are always applied?"*

Edited extracts from the Health and Safety Review of PowerNet Limited June 2016
prepared for Mr Jason Franklin CEO by Oreti Group

The Control Framework Approach

Developed as a practical way to apply new control thinking a Control Framework (CFw) is based on answering these organising questions:

1. *What are the required operating states?*
2. *What can cause failure?*
3. *What are the inputs that prevent or mitigate failure?*
4. *How are these inputs*
 - ***specified***
 - ***implemented*** and
 - ***monitored?***

Working through each question systematically allows decisions about the robustness and reliability of the business inputs that must be in place for work to go consistently right.

While the approach is aligned with Failure Modes and Effects Analysis, Human Factors and the ICMC Critical Control Methodology, it takes good theory into real-world practice by working with experienced and qualified personnel who map actual business inputs to business outcomes. Another strength in working this way is that it allows for ongoing and iterative updating of content.

Developing a CFw follows these steps:

1. Confirm the safe and productive outcomes relevant at an enterprise level, these Required Operating States (ROS) are the basis of CFw organisation e.g. *ROS - MAD: PowerNet personnel maintain minimum approach distances from live conductors while they safely and productively work on the electricity distribution network*
2. Identify and catalogue the credible failure modes that can compromise each required operating state e.g. *High voltage MAD breach during transformer replacement caused by installation position.*
3. Based on each credible failure mode, identify the business inputs (control supports) that prevent or mitigate the required operating states being compromised e.g. *Redesign transformer installation position for network assets so MAD can be maintained without HV isolation (long-term), isolate HV conductors before replacing the transformer (immediate)*
4. Using multiple information sources, map how each business input is specified, implemented and monitored to prepare a draft Control Framework Version 1- see figure 3
5. Present Control Framework Version 1 to knowledgeable and experienced practitioners for review, updating and validation to Control Framework Version 1 (baseline)

6. From the validation workshop, confirm the opportunities for improvement across PowerNet
7. Continue to update the CFw as a primary reference e.g. the starting point for further improvement reviews

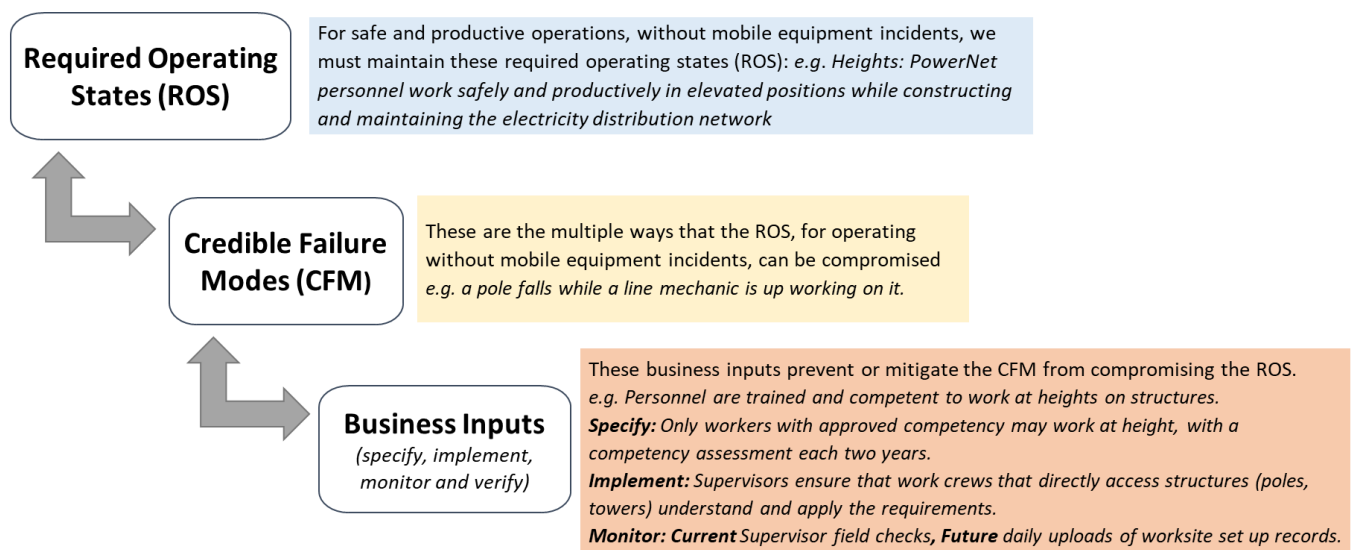
As illustrated in Figure 3, applying the CFw approach produces a cross-linked hierarchal structure made up of:

The few **Required Operating States (ROS)** that deliver business outcomes,

The many **Credible Failure Modes** that can compromise the Required Operating States and interrupt the delivery of business outcomes

The many **Business Inputs** that support the establishment and maintenance of the required operating states through preventing or mitigating the credible failure modes.

Figure 3 – The Control Framework Approach with PowerNet example



The CFw approach is particularly useful for understanding those business inputs that are wholly or partly dependent on the decisions and actions of people. It also provides clarity in ongoing dynamic interactions between multiple required operating states necessary for productive and safe work e.g. fit for purpose equipment is selected, approved for use then maintained and operated by competent personnel.

Deployment of the Control Framework Approach at PowerNet

In November 2017, PowerNet held a workshop that was attended by a cross-section of experienced PowerNet personnel. Over six days of focused work they developed the 12 **Required Operating States** detailed in Table 1, confirmed 55 **Credible Failure Modes** and identified 165 **Business inputs** that prevent or mitigate the Credible Failure Modes from compromising these Required Operating States.

Table 1 – PowerNet Control Framework Required Operating States, May 2019

Required Operating State Name and Description	Control Intent
ROS 01- Isolation: PowerNet electrical isolation processes are always effective and efficient	<i>ROS Intent - When work is required on network assets, they are de-energised before work begins and remain de-energised as detailed in the work plan. Isolation processes work as designed and support productive work and avoid 'contact with electricity' injuries and fatalities.</i>
ROS 02 - MAD: PowerNet personnel maintain minimum approach distances from live conductors while they safely and productively work on the electricity distribution network	<i>ROS Intent - Nil injury or lethal contact with electricity caused through breaching minimum approach distances to live conductors.</i>
ROS 03 - Insulation: when working on or close to live conductors, PowerNet personnel use the right insulated equipment and wear the correct PPE	<i>ROS Intent - Trained PowerNet personnel work assess voltage hazard and select and use the correct insulated equipment and wear appropriate PPE to carry out productive and safe work on or close to live conductors. Nil injury or lethal contact with electricity.</i>
ROS 04 - Heights: PowerNet personnel work safely and productively in elevated positions while constructing and maintaining the electricity distribution network	<i>ROS Intent - Nil fall from height incidents and injuries including those caused by dropped objects.</i>
ROS 05 - Lifting: trained, competent and authorised PowerNet personnel, using fit for purpose equipment, work safely and productively shifting, lifting and placing loads	<i>ROS Intent - Nil load shifting or lifting injuries or incidents. This includes equipment damage caused by loss of control.</i>
ROS 06 - Mobile equipment: is used productively and safely at PowerNet work sites	<i>ROS Intent - PowerNet personnel use mobile equipment safely and productively while constructing and maintaining electrical distribution network.</i>
ROS 07 - Site access: PowerNet vehicles access work sites safely and productively	<i>ROS Intent - PowerNet personnel routinely access work sites without incident.</i>
ROS 08 - Public roads: all PowerNet vehicles travelling on public roads are roadworthy, secure and operated by competent and alert drivers	<i>ROS Intent - PowerNet vehicles operate on public roads without causing incidents.</i>
ROS 09 – Tree maintenance: trained, competent and authorised arborists carry out tree maintenance tasks productively and safely	<i>ROS Intent - Productive and safe execution of tree maintenance tasks at height, close to energised power lines, using specialist tools and controlling how objects fall.</i>
ROS 10- Confined space: PowerNet personnel carry out safe and productive work in confined or restricted spaces	<i>ROS Intent - All confined and restricted work scenarios are identified, and work is undertaken by trained and competent personnel following good industry practice. Work in confined or restricted space is completed effectively and without incident.</i>
ROS 11- Helicopters: when required helicopters are used safely and productively	<i>ROS Intent - Nil helicopter incidents or fatalities while undertaking contract work for PowerNet</i>
ROS 12- Explosives: as required, safe and productive site work with explosives is undertaken	<i>ROS Intent - Nil storage, handling, and use explosive incidents</i>

This analysis has informed PowerNet business improvement plans through 2017 and the CFw hierarchy has been used to organise and link company information on a cloud-based platform. The CFw work has provided a backbone for connect existing company processes, external obligations and other information.

In September 2018, a series of CFw consultation and validation half-day workshops were held across Otago and Southland. Participants, comprising 120 line mechanics, technicians, arborists and supervisors were invited to validate the work to date. They were introduced to the Control Framework Approach and then carried out a line by line, granular review of summary control sheets linking all the CFw components. The experienced employees identified a total of 76 improvements to the PowerNet CFw Version 1.

Designing and Delivering an Integrated and Coherent Health and Safety Approach

PowerNet personnel are well-trained professionals who routinely deliver productive and safe outcomes while undertaking hazardous tasks. However, they work in an industry where almost all fatality prevention controls have some dependence on the decisions and actions of people.

For PowerNet, the journey to prevent fatalities and improve health and safety performance began with acknowledging the challenges of improving these controls. We understood our operational and safety risks but as accountable leaders, we could not easily answer simple questions about controls; are they adequately specified, appropriately implemented and how do we know that they are in place?

We are early adopters of the Control Framework approach and its supporting platform, and it is assisting us to develop coherent and operationally integrated answers to these questions by:

- Capturing the know-how and experience of long-term dedicated employees
- Systematically verifying that the PowerNet business inputs that prevent fatalities are adequately designed and can be implemented and monitored,
- Assisting decluttering decisions by identifying content and processes that are unlinked to business purpose while avoiding the creation of further health and safety bureaucracy
- Engaging with employees and honouring their experience

Next steps will see further digitisation of and linking business content and systems to support the development of real-time processes that:

- Get configured information to PowerNet end users so that they can make the right decisions
- Provide a means for field staff to demonstrate their ongoing professionalism through uploading records including photographs and other information that confirm that they are deploying and maintaining operational controls
- Improve support for supervisors and team leaders allowing remote monitoring of work crews to ensure that specific controls by task are in place
- Support effective governance through close to real time verification reporting
- Enable immediate and transparent legislative compliance by linking PowerNet work processes and uploaded records to general and specific external obligations
- Increase our business analytical capability.

Real challenges remain, including maintaining employee engagement and other integration challenges that range from linking multiple business systems to solving cloud-based resource access issues when employees are out of data range.

While the initial drivers for this work were to improve health and safety performance, we are now recognising broader operational and strategic opportunities and benefits. Some of these come from linking this important work with other business initiatives. We expect that an ongoing alignment will accelerate the delivery of operational excellence in our business that includes working without hurting people.

"We believe that far more resource must go into preventing ill-health, injury and death – and that the returns will come in greater quality of life for New Zealanders, higher productivity, and reduced medical and other costs."

The Report of the Independent Task Force on workplace health and safety, He Korowai Whakaruruhau, April 2013

"Failure to manage health and safety risk effectively has both human and business costs. The price of failure can be the damaged lives of workers, their families and friends, as well as direct financial costs, damaged reputations and the risk of prosecution."

Health and Safety Guide: Good Governance for Directors, March 2016. Institute of Directors in New Zealand in partnership with WorkSafe NZ

Bibliography

Bruno T, Frankel D, Léger S, & Volpin A. (May 2018). *How utilities can keep the lights on*. Electric Power & Natural gas Practice McKinsey and Company

Conklin, Todd (2012) - *Pre-Accident Investigations, An Introduction to Organizational Safety*, Ashgate, 2012 ISBN 978-1-4094-4782-5/9/0

Dekker, Sidney (2011) - *Drift in Failure, From Hunting Broken Components to Understanding Complex Systems*, Ashgate

Hollnagel, E (2018). *Safety-I and Safety-II*. E-book Taylor & Francis Ltd London

Hollnagel, E. (2011). *The ETTO principle. Efficiency-Thoroughness Trade-Off or why things that go right sometimes go wrong*. Farnham, UK: Ashgate.

Hollnagel, E. (Ed.) (2010). *Safer complex industrial environments*. Boca Raton, FL: CRC Press.

ICMM Health and Safety Critical Control Management Good Practice Guide 2015
<https://www.icmm.com/website/publications/pdfs/health-and-safety/8570.pdf>

Institute of Directors in New Zealand in partnership with WorkSafe NZ (March 2016) *Health and Safety Guide: Good Governance for Directors*

**Safe | Efficient | Reliable |
Power to Communities**